

VOLUME 14

PART I

NORTH AMERICAN FLORA

SPHAEROCARPALES-MARCHANTIALES

SPHAEROCARPACEAE, RIELLACEAE

CAROLINE COVENTRY HAYNES, MARSHALL AVERY HOWE

RICCIACEAE

MARSHALL AVERY HOWE

CORSINIACEAE, TARGIONIACEAE, SAUTERIACEAE, REBOULIACEAE, MARCHANTIACEAE

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ANNOUNCEMENT

NORTH AMERICAN FLORA is designed to present in one work descriptions of all plants growing, independent of cultivation, in North America, here taken to include Greenland, Central America, the Republic of Panama, and the West Indies, except Trinidad, Tobago, and Curaçao and other islands off the north coast of Venezuela, whose flora is essentially South American.

The work will be published in parts at irregular intervals, by the New York Botanical Garden, through the aid of the income of the David Lydig Fund bequeathed by Charles P. Daly.

It is planned to issue parts as rapidly as they can be prepared, the extent of the work making it possible to commence publication at any number of points. The completed work will form a series of volumes with the following sequence:

Volume 1. Myxomycetes, Schizophyta.

Volumes 2 to 10. Fungi.

Volumes 11 to 13. Algae.

Volumes 14 and 15. Bryophyta.

Volume 16. Pteridophyta and Gymnospermae.

Volumes 17 to 19. Monocotyledones.

Volumes 20 to 34. Dicotyledones.

The preparation of the work has been referred by the Scientific Directors of the Garden to a committee consisting of Dr. N. L. Britton, Dr. W. A. Merrill, and Dr. J. H. Barnhart.

Professor John M. Coulter, of the University of Chicago; Mr. Frederick V. Coville, of the United States Department of Agriculture; and Professor William Trelease, of the University of Illinois, have consented to act as an advisory committee.

Each author will be wholly responsible for his own contributions, being restricted only by the general style adopted for the work, which must vary somewhat in the treatment of diverse groups.

The subscription price is fixed at \$1.50 for each part; it is expected that four or five parts will be required for each volume. A limited number of separate parts will be sold at \$2.00 each. Address:

THE NEW YORK BOTANICAL GARDEN

BRONX PARK

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DIVISION BRYOPHYTA

Plants with a pronounced alternation of generations, the sexual generation or gametophyte existing as an independent individual, the very different and often less conspicuous asexual generation or sporophyte partially or completely parasitic on the gametophyte.

Gametophyte occasionally thalloid, more often differentiated into stem and leaves. Sexual organs consisting of usually stalked antheridia, producing very numerous biciliate motile sperms, and stalked, sessile, or imbedded archegonia including an egg and a row of superposed canal-cells, the latter deliquescent or converted into slime previous to the fertilization of the egg. Fertilized egg developing directly into the sporophyte, the wall of the archegonium or its ventral portion usually converted into a protective covering, the calyptra.

Sporophyte without differentiation into stem and leaves, consisting in the simplest cases of a spore-bearing capsule only, but usually showing also a simple basal absorbent organ, the foot, and a more or less elongate seta (or stalk). Spores apparently of one kind and size in a single capsule or a single species, but in dioicous species sometimes showing sex differentiation in cytological characters (*Sphaerocarpos*). Spores producing on germination a usually inconspicuous and more or less ephemeral thalloid or filamentous protonema, developing into the main gametophyte directly or by budding.

Class HEPATICAE

Terrestrial, epiphytic, or rarely aquatic plants.

Gametophyte usually dorsiventral, consisting of a thallus or more or less differentiated into stem and leaves, attached to the substratum by means of rhizoids (true roots none), bearing protective slime-organs of various kinds, growing by means of an apical cell or a group of apical cells, arising from a more or less ephemeral, filamentose or thallose protonema, the latter originating directly from an asexual spore. Sexual organs borne either superficially (laterally) or apically, in the latter case always limiting the growth of the sexual axis; antheridia and archegonia on the same plant or on separate plants. Antheridium stalked, consisting of a single layer of sterile cells enclosing a mass of sperm-mother-cells, from which biciliated sperms arise. Archegonium short-stalked, sessile or imbedded in the gametophyte, consisting of a venter with a single egg and a ventral canal-cell and of a neck with a row of cervical canal-cells, both venter and neck bounded by sterile cells. Fertilized egg developing directly into the sporophyte, the wall of the venter usually developing into a protective covering, or calyptra, remaining intact until the sporophyte is nearly mature.

Sporophyte radial, spheric, or elongate, usually limited in growth, either undifferentiated into organs or else differentiated into a capsule (spore-bearing organ), a seta (or stalk), and a foot (absorbing organ) arranged in a linear series, the seta in rare cases being replaced by a zone of meristematic cells. Capsule usually consisting of a wall of sterile cells (derived from the amphithecium) and a spore-sac (derived largely or wholly from the endothecium); in rare cases consisting of a wall and a spore-sac (derived from the amphithecium) and a central columella (derived from the endothecium); dehiscing irregularly, by means of a more or less definite lid, or by longitudinal splits; spore-sac containing spores (developed in tetrads from spore-mother-cells) or spores and sterile cells, the latter often elongate and provided with spiral bands of thickening on their walls (elaters).

Order SPHAEROCARPALES

BY CAROLINE COVENTRY HAYNES AND MARSHALL AVERY HOWE

Gametophyte a thallus, forming rosettes (*Sphaerocarpos*), or showing a tendency towards the development of an elongate axis and leaves (*Geothallus*), or having a cylindric axis which develops dorsally a wing-like expansion (*Riella*). Air-chambers wanting. Root-hairs with smooth walls. Antheridia and archegonia usually on separate plants. Each antheridium and archegonium provided with a special envelope or involucre, or (in *Riella*) antheridia in seriate pockets or locelli. Sporophyte a capsule with no fibrous thickenings in the thin, single-layered, indehiscent or irregularly dehiscing walls; seta very short or subobsolete; foot present; elaters represented by thin-walled amyliiferous cells.

Terricolous; axis or stem of gametophyte rather short, with lateral leaf-like expansions.

Aquatic, growing submersed; axis or stem of gametophyte elongate and cylindric, produced dorsally into a wing-like expansion.

Fam. 1. SPHAEROCARPACEAE.

Fam. 2. RIELLACEAE.

Family 1. SPHAEROCARPACEAE

BY CAROLINE COVENTRY HAYNES AND MARSHALL AVERY HOWE

Gametophyte a simple, orbicular thallus with notched margins, each notch marking the position of a growing point with an apical cell; or a larger somewhat elongate thallus, with a more definite organization of stem and leaves. Antheridia and archegonia on separate plants. Antheridia spheric, aggregated or scattered on the dorsal surface, each enclosed in a flask-shaped involucre. Archegonia occurring in a similar manner, each enclosed in a subglobose or tubular involucre. Calyptra ruptured. Spores remaining united in tetrads or separating.

Female gametophyte suborbicular, the leaf-like lobes almost entirely concealed by the numerous subglobose, cylindric-ovoid, or fusiform-clavate involucre; annual.

1. SPHAEROCARPOS.

Female gametophyte a somewhat elongate thickened axis, with conspicuous crowded irregularly succubous foliar expansions on either side; perennial through the conversion of a large portion of the axis into a tuber.

2. GEOTHALLUS.

1. SPHAEROCARPOS* (Micheli) Boehm. in Ludwig, Def. Gen. Pl. ed. 2. 501. 1760.

Gametophyte thallus-like, small, orbicular to oblong or cuneate, simple or dichotomous, the broad multistratose midrib passing gradually into the lateral enfolding unistratose lobes; cells thin-walled, quadrate to long-pentagonal and hexagonal, without trigones. Antheridia and archegonia thickly aggregated along the midrib or dorsal surface of thallus. Antheridial plants minute, commonly tinged with purple. Antheridia oval, short-stalked, their involucre flask-shaped. Archegonial involucre tubular to pyriform or subglobose, sessile. Calyptra ruptured early, a portion with shriveled archegonium-neck long persisting on the apex of capsule. Sporophyte consisting of a globose capsule, an obsolescent seta, and a bulbous foot, the last often remaining in the thallus after the detachment of the capsule. Capsule indehiscent, its wall consisting of a single layer of cells destitute of spiral, annular, or other local thickenings. Spores permanently united in tetrads, with two exceptions, *S. Donnellii*, in which they become free at full maturity, and *S. cristatus*, in which they separate early in the development of the sporophyte; spore-tetrads, when persistent, distinctly areolate, appearing crenulate, or subechinulate in optical section; spores, when separate, compressed-tetrahedral, rounded-lenticular, or sometimes concavo-convex, areolate or cristate, in *S. Donnellii* prominently tuberculate in the basilar circumference. Accompanying the spore-mother-cells are smaller starch-bearing sterile cells probably equivalent to elaters morphologically, but lacking a spiral band, these more or less shriveled and obscure at the maturity of the spores.

Type species, *Targionia Sphaerocarpos* Dicks.

Spores permanently united in tetrads.

Female involucre contracted at the apex, the diameter of its orifice much less than that of the involucre; spore-tetrad regularly areolate.

1. *S. texanus*.

Female involucre wide-mouthed, the diameter of its orifice equaling or often exceeding that of the subjacent part of the involucre; spore-tetrad cristate-reticulate.

2. *S. hians*.

Spores not permanently united in tetrads.

Spores separating at maturity, 85–138 μ in maximum diameter, areolate, each while united in the tetrad commonly showing a prominent protuberance about 12 μ high in middle of outer face and after separation exhibiting a coarsely lobed basilar margin.

3. *S. Donnellii*.

Spores separating long before maturity, 52–80 μ in maximum diameter, typically cristate, less commonly irregularly and sparingly areolate.

4. *S. cristatus*.

*Often spelled *Sphaerocarpus*, here regarded as a mere variant spelling.

1. *Sphaerocarpos texanus* Aust. Bull. Torrey Club 6: 158. 1877.

Sphaerocarpos terrestris Bisch. Nova Acta Acad. Leop.-Carol. 13: 829, in part. 1827.
Sphaerocarpos californicus Aust. Bull. Torrey Club 6: 305. 1879.
Sphaerocarpos Berterii Aust. Hep. Bor.-Am. 34. 1873. Not *S. Berterii* Mont. 1838.
Sphaerocarpos Michellii californicus Aust.; Underw. Bull. Ill. Lab. Nat. Hist. 2: 30. 1884.
Sphaerocarpos terrestris californicus Underw. Zoe 1: 364. 1890.

Archegonial thallus suborbicular or somewhat cuneate, 3–5 mm. \times 4–8 mm., cespitose, bright-green when living, dingy-green or sometimes light olive-green when dried, dichotomous, the leaf-like unistratose lobes almost entirely concealed by the involucre; marginal cells generally quadrate, averaging 45 μ ; archegonial involucre 1.2–2.6 mm. high, sessile, long-cylindric, fusiform-clavate, very rarely subpyriform, more or less acuminate, the cells at the small orifice usually arcuate-protuberant, 45–60 μ ; antheridial thallus oblong to orbicular, 2 mm. in diameter, forking several times; antheridial involucre 270–360 μ high, purplish; capsule 675 μ in average diameter, the bulbous foot remaining in the thallus on detachment of capsule; spores permanently united in tetrads, these 72–170 μ in diameter, golden-brown to dark opaque brown, regularly areolate, minutely granulate, the meshes 13–30 μ in diameter, each in rare cases with a single median papilla or tubercle, the ridges finally high, sinuous, crenulate, or deeply and irregularly dissected, occasionally forming obtuse spines at the points of intersection.

TYPE LOCALITY: [San Marco] Texas.

DISTRIBUTION: Virginia to Missouri, Florida, Texas, and California; also in Uruguay, Europe, and northern Africa.

ILLUSTRATIONS: Bull. Torrey Club 37: *pl.* 26, 27; Nova Acta Acad. Leop.-Carol. 13: *pl.* 44, p.p.; Mem. Torrey Club 7: *pl.* 100, *f.* 9–12; Rab. Krypt.-Fl. 6: *f.* 192; Rev. Bryol. 34: *f.* 4–10, 12–14; 36: *f.* 4, 7, 10.

EXSICCATAE: Aust. Hep. Bor.-Am. 138; Haynes, Am. Hep. 76.

2. *Sphaerocarpos hians* Haynes, Bull. Torrey Club 37: 225. 1910.

Archegonial thallus oblong or orbicular, 4–6 mm. in diameter, growing in isolated groups, bright-green when dried, the margin lobed and crispate, ascending, the marginal cells generally quadrate, averaging 47 μ ; archegonial involucre 1–2 mm. high, sessile, not crowded together nor entirely concealing the thallus, tubular-ovoid, sometimes larger at apex and slightly flaring, the orifice large, of the diameter of the involucre or larger, irregular and entire, the cells at the orifice 26 \times 39 μ , with thick walls; antheridial thallus cuneate to orbicular, 2 mm. in diameter, forking several times, the leaf-like lobes curved over the involucre; antheridial involucre 240–400 μ in height, green, becoming brown and purplish with age, their cells, especially those of the neck, thin-walled and non-protuberant; capsules averaging 585 μ in diameter, the bulbous foot remaining attached to capsule; spores permanently united in tetrads, these 66–85 μ in diameter, golden-brown, cristate-reticulate, the crests sinuous, 5 μ high, delicate, somewhat elevated at the angles, occasionally crossing the boundaries of the spores, anastomosing irregularly, forming closed or partially closed meshes or occasionally running in parallel lines towards the boundaries of the spore, a blunt spine occurring now and then within the areolae, the margin in optical section appearing crenulate to tuberculate.

TYPE LOCALITY: Pullman, Washington.

DISTRIBUTION: Washington.

ILLUSTRATIONS: Bull. Torrey Club 37: *pl.* 28.

3. *Sphaerocarpos Donnellii* Aust. Bull. Torrey Club 6: 157. 1877.

Archegonial thallus cuneate, averaging 9 mm. long and 6 mm. in greatest width, forming mats, dark-green, faded-green when dried, forking repeatedly, the lobes large, explanate, the margin sinuous, the marginal cells generally oblong, 33 \times 66 μ ; archegonial involucre 2–2.3 mm. high, sessile, not crowded together, somewhat isolated, ovoid-ellipsoid, tubular, truncate at the apex, the orifice somewhat conspicuous, the cells at the orifice 39–46 μ ; antheridial thallus cuneate, 3 mm. in maximum diameter, each of its five or six main divisions once or twice furcate, the lobes large, leaf-like; antheridial involucre 0.5–1 mm. in height, 3 times their diameter, red-brown, the cells with somewhat thick walls; capsules averaging 725 μ in

diameter, the bulbous foot remaining in thallus on detachment of the capsule; spores separating at maturity; spore-tetrads averaging $145\ \mu$ in diameter just before separating, provided with a prominence $12\ \mu$ in height near the middle of the outer face of each spore, this becoming shriveled at maturity; spores $85\text{--}138\ \mu$ in maximum diameter, yellow to opaque brown, regularly areolate and coarsely granulate, the meshes large, $13\text{--}26\ \mu$, the ridges wrinkled and sinuous, forming elevations at points of intersections of meshes, the spores after separation showing a conspicuous coarsely lobed basilar margin.

TYPE LOCALITY: Jacksonville, Florida.

DISTRIBUTION: Florida and Georgia.

ILLUSTRATIONS: Bull. Torrey Club 37: *pl.* 29, 30.

EXSICCATAE: Underw. & Cook, Hep. Am. 61 (as *S. terrestris*), 62.

4. *Sphaerocarpos cristatus* M. A. Howe, Mem. Torrey Club 7: 66. 1899.

Archegonial thallus suborbicular, 3–8 mm. in diameter, pale-green when dried, the marginal lobes orbicular, ascending, the marginal cells generally quadrate, $26\text{--}45\ \mu$; archegonial involucre 0.85–1.2 mm. high, sessile, thickly aggregated, at first cylindric, soon becoming subglobose or obovoid, rounded at apex, the orifice small, the cells at the orifice arcuate-protuberant, $26\text{--}40\ \mu$; antheridial thallus cuneate, 2 mm. long, often once furcate, with oblong-ovate lobes; antheridial involucre $500\text{--}580\ \mu$ in height, about 2.5 times their diameter; capsules $500\text{--}800\ \mu$ in diameter, the bulbous foot remaining attached to the capsule; spores separating long before the maturity of the capsule, never persisting in tetrads, compressed, rounded-biconvex or sometimes concavo-convex, yellowish-brown or pale-yellow, $52\text{--}80\ \mu$ in maximum diameter, cristate, the crests sinuous, $4\text{--}7\ \mu$ high, subcrenulate, mostly radiating from near the middle of each of the two faces, often 1–3 times furcate, sparingly anastomosing, forming sometimes 1–6 (rarely more) completely closed meshes in most cases near the middle of the face.

TYPE LOCALITY: Near Stanford University, California.

DISTRIBUTION: California.

ILLUSTRATIONS: Mem. Torrey Club 7: *pl.* 100, *f.* 1–8; Bull. Torrey Club 37: *pl.* 31; [the descriptions and drawings published by D. H. Campbell in his "Notes on *Sphaerocarpos*" (*Erythea* 4: 73–77. 1896) probably relate chiefly to this species].

EXSICCATAE: Underw. & Cook, Hep. Am. 160 (as *S. terrestris californicus* [*S. texanus*], a little of which is intermingled in some of the sets).

2. *Geothallus* Campb. Bot. Gaz. 21: 13. 1896.

Gametophyte transitional in character between the thalloid and foliose types of Hepaticae, consisting of a simple or dichotomous flattened axis several layers of cells in thickness, passing somewhat abruptly at the sides into large crowded irregularly succubous, mostly unistratose leaf-like expansions and often bearing smaller irregularly disposed leaf-like laminae on the dorsal surface; cells large, thin-walled, root-hairs numerous, long, colorless. Antheridial and archegonial plants similar, or the former slightly smaller. Sexual organs usually few, often standing near the axils of the leaf-like lobes, enclosed in most cases singly by unistratose involucre. Antheridia ovoid, on very short stalks, these composed of more than a single vertical series of cells; involucre flask-shaped. Archegonial involucre at first cylindric, or somewhat flask-shaped, becoming saccate or campanulate at maturity of the sporogonium, the orifice large. Calyptra mostly of two layers of cells, ruptured rather late, the upper part, with the archegonium-neck, persisting on the apex of the capsule. Sporogonium consisting of a nearly spheric indehiscent capsule, a very short seta, and a bulbous foot. Capsule-wall of a single layer of large, dark-colored cells, without annular or other local thickenings. Spores separate at maturity, very large, thick-walled, the inner face reticulate, otherwise smooth, accompanied by oval or ellipsoidal-cylindric, thin-walled, sterile cells.

Type species, *Geothallus tuberosus* Campb.

1. *Geothallus tuberosus* Campb. Bot. Gaz. 21: 13. 1896.

Plant simple or once dichotomous, 5–7 mm. long, 3–5 mm. wide, perennial through the conversion of a large portion of its axis into an oval or flattened tuber; leaf-like lobes nearly horizontal or somewhat ascending, extremely variable in form, mostly oblong, obovate, or linear-ligulate, 1.5–2 mm. in length, rarely broader than long, sometimes cristate-laminate at base, the margins entire or slightly sinuate; marginal cells pentagonal, or subquadrate-oblong, $50\text{--}65 \times 35 \mu$, the submarginal hexagonal-oblong or irregularly pentagonal, $50\text{--}100 \times 35\text{--}60 \mu$, those towards the base of the lobes often becoming over 200μ in length; antheridial involucre 0.45 mm. in height; capsule 0.8 mm. in diameter, the seta about 90μ long; spores nearly black, $120\text{--}150 \mu$ in maximum diameter, spore-wall smooth or very minutely punctulate and very thick ($8\text{--}12 \mu$) except as to the comparatively small inner face where it is thinner and bears reticulate ridges, the meshes about 15μ in width; sterile cells $48\text{--}108 \mu$ long.

TYPE LOCALITY: Near San Diego, California.

DISTRIBUTION: California.

ILLUSTRATIONS: Bot. Gaz. 21: *pl.* 2; Ann. Bot. 10: *pl.* 24, 25.

Family 2. RIELLACEAE

CAROLINE COVENTRY HAYNES AND MARSHALL AVERY HOWE

Gametophyte aquatic, growing submersed; stem or cylindric axis developing a dorsal leaf-like lamina or wing (or two wings in the Algerian *R. bialata*), the position of the root-hairs, scale-like appendages, antheridia, and archegonia showing the plant to be bilaterally symmetric in the plane of the wing. Antheridia arranged serially in the margin of the lamina, becoming enclosed separately in pockets or locelli formed by local thickenings of the otherwise unistratose wing. Archegonia arranged serially along the axis in acropetal order, each surrounded by a flask-like involucre.

1. RIELLA Mont. Ann. Sci. Nat. III. 18: 11. 1852.

Durinea Bory & Mont. Compt. Rend. Acad. Sci. Paris 16: 1115. 1843. Not *Durinea* Mérat, 1829; nor *Durinea* Boiss. & Reut. 1842.
Maisonneuvea Trevisan, Mem. Ist. Lomb. 13: 442. 1877.

Gametophyte usually growing erect or suberect in water, rarely floating, decumbent or prostrate on subsidence of water, commonly several times forked. Dorsal lamina often undulate and sometimes (in Algerian *R. helicophylla*) having the appearance of being spirally disposed. Lanceolate or linguiform latero-ventral scales or leaves more or less conspicuous or rudimentary, sometimes intermingled with multicellular gemmae. Dioicous or monoicous; involucre of the mature sporophyte ovoid, ellipsoid, or subglobose, smooth, papillate, or 8-winged, small-mouthed. Capsule subglobose; seta short. Spores spinose, papillose, or verrucose, often with basal reticulations.

Type species, *R. helicophylla* (Bory & Mont.) Mont.

1. *Riella americana* Howe & Underw. Bull. Torrey Club 30: 218. 1903.

Erect or ascending, 10–30 mm. high, simple or more commonly 1–4 times furcate; axis elliptic in section, 0.2–0.8 mm. wide, mostly 6–10 cells thick, with root-hairs borne only on the basal parts and usually few; wing 2–5 mm. broad, rounded-falciform at apex, slightly undulate-crisped, subentire or erose, tapering towards the base and commonly deficient below the first dichotomy; cells near the axis about 60 μ in greatest diameter, those near the margin about 40 μ ; scales few, small, 0.2–0.6 mm. long, linguiform and obtuse or irregularly lanceolate and subacute, those near the growing apex usually intermingled with multicellular gemmae; gemmae trichomic in origin, soon oblong or orbicular-oblong in outline, showing later a median constriction and becoming finally panduriform and subspatulate. Dioicous; antheridia about 0.36 \times 0.16 mm., sometimes as many as 75 (including empty locelli) in a single elongated marginal series; archegonial gametophyte, or each of its branches, maturing for the most part 3–12 sporogonia in acropetal order; involucre smooth, ellipsoid-ovoid or at full maturity subglobose-ovoid, 1.4–1.8 \times 0.8–1.2 mm., narrowed rather gradually to the truncate or slightly pointed subpapillose orifice; capsule globose, 0.8–1 mm. in diameter, the seta about 0.2 mm. long, mostly a trifle shorter than the ovoid-conic foot; spores dark-brown, 100–130 μ in maximum diameter (spines included), the outer face bearing numerous sometimes curved spines 10–24 μ long, with dilated apices, these spines more or less connected by radiating basal membranes

forming irregular reticulations, the inner faces bearing conic, non-capitate spines, 3-6 μ long, with basal membranes obsolescent or entirely wanting.

TYPE LOCALITY: Limpia Cañon, Texas.

DISTRIBUTION: Western Texas (to South Dakota ?).

ILLUSTRATIONS: Bull. Torrey Club 30: *pl. 11*; *pl. 12, f. 21, 22*.

EXSICCATAE: Tracy & Earle, Pl. Texas 251.

Order MARCHANTIALES

BY ALEXANDER WILLIAM EVANS

Protonema consisting of a short unbranched filament, broadening out into a short unbranched and slightly differentiated, embryonic thallus, the latter giving rise directly to the complex adult thallus. Thallus flat and dorsiventral, ribbon-shaped, thick or thin, branching dichotomously or by means of intercalary ventral outgrowths, usually differentiated into a dorsal layer or epidermis (with pores), a chlorophyll-bearing tissue (with air-chambers in one or more layers), and a compact ventral tissue, the last giving rise on its lower surface to rhizoids and protective scales; green cells with numerous, small, disc-shaped chloroplasts; rhizoids unicellular and unbranched, usually of two kinds, one with smooth walls, the other (tuberculate) with rod-like or band-like thickenings projecting into the lumen. Sexual organs dorsal, borne either on an ordinary thallus or thallus-branch or on a more or less specialized receptacle; the antheridia and archegonia on the same plant or on separate plants; antheridia with short stalks, more or less elongate, borne in deep depressions; archegonia with a long neck, containing four to eight canal-cells; calyptra well developed, ruptured irregularly by the mature sporophyte. Sporophyte either elongate and differentiated into capsule, seta, and foot, or else spheric and undifferentiated, consisting of a capsule only. Capsule with little or no chlorophyll, containing both spores and sterile cells or spores only, dehiscing irregularly or by means of a more or less distinct apical lid; stalk (when present) short, elongating sufficiently at maturity to force the capsule through the calyptra; foot small usually bluntly conic.

Sporophyte consisting of a capsule only, the spores being set free by the disintegration of the capsule-wall and adjoining tissues; sterile cells not present in the capsule.

Fam. 1. RICCIACEAE.

Sporophyte consisting of a capsule, a seta, and a foot, the spores being set free by the rupture of the capsule-wall; sterile cells (usually in the form of elaters) present in the capsule.

Archegonia and antheridia not borne on specialized receptacles but forming irregular groups on ordinary thallus-branches; sporophytes forming groups or occurring singly.

Archegonia distinctly dorsal in position, one or several sporophytes maturing from each group; sterile cells in capsule sometimes with thickenings in their walls but not developed as elaters.

Fam. 2. CORSINIACEAE.

Archegonia apparently ventral in position, arising close to the apex of the thallus-branches, only one sporophyte maturing from each group; sterile cells in capsule developed as elaters.

Fam. 3. TARGIONIACEAE.

Archegonia (and sporophytes) borne on specialized stalked receptacles; antheridia borne on specialized, stalked or sessile receptacles, or else forming groups on ordinary thallus-branches.

Epidermal pores everywhere simple; air-chambers without green filaments; antheridia borne on sessile receptacles or forming irregular groups on ordinary thallus-branches; annular bands of thickening present in the capsule wall.

Fam. 4. SAUTERIACEAE.

Epidermal pores usually compound on the receptacles, simple on the vegetative thallus; air-chambers without green filaments; antheridia borne on sessile receptacles or forming irregular groups on ordinary thallus-branches; annular bands of thickening not present in the cells of the capsule-wall.

Fam. 5. REBOULIACEAE.

Epidermal pores (when present) compound or barrel-shaped on the receptacles, simple or compound on the vegetative thallus; air-chambers with or without green filaments; antheridia borne on stalked or sessile receptacles; annular bands of thickening usually present in the cells of the capsule-wall.

Fam. 6. MARCHANTIACEAE.

Family 1. RICCIACEAE

BY MARSHALL AVERY HOWE

Gametophyte terricolous or aquatic, annual or perennial, once to several times dichotomous, often forming rosettes, half-rosettes, or flabelliform expansions, monoicous or dioicous. Stomata wanting or rudimentary in *Riccia*, well developed in *Oxymitra*, moderately well developed in *Ricciocarpus*. Root-hairs (wanting in aquatic forms) of two kinds upon the same plant, the one with smooth walls, the other with interior peg-like papillae, or the latter rarely wanting (*Riccia Frostii*). Ventral scales usually obvious, but sometimes rudimentary, and now and then apparently lacking. Antheridia and archegonia arising singly from the dorsal surface just back of the growing apex, soon becoming deeply immersed in the thallus, the elongate archegonium-neck commonly exserted, the walls of the efferent canal of the antheridial cavity often produced into a cylindric or conic-cylindric elevation.

Sporophyte a capsule, without foot or seta, enclosed by the calyptra, in which the spores come to lie at maturity through the disappearance of the capsule-wall. Inner cells all producing spores or (*Oxymitra*) an inconspicuous few of them remaining sterile; spores separating at or before maturity or (*Riccia* § *Thallocarpus*) persistently united in fours, the separate spores large, subspheric or more commonly more or less tetrahedral, with a rounded outer face and plane inner faces, the surfaces marked with free or most frequently mesh-forming ridges, or simply with spines, the angles of the areolae often with papilliform elevations, the inner (plane) faces usually less strongly marked than the outer.

Sporophyte without an involucre.

Stomata wanting or rudimentary; assimilative layer consisting of vertical or subvertical columns of cells bounding very narrow air-canals, or consisting of larger polyhedral or subclavate chambers bounded by unistratose lamellae; antheridia scattered.

1. RICCIA.

Stomata moderately well developed; assimilative layer of large irregularly polyhedral chambers, visible through dorsal epidermis as areolae; antheridia in a median ridge-like androecium; gametophyte floating or occasionally more or less terricolous.

2. RICCIOCARPUS.

Sporophyte with a conspicuous conic-pyramidal or trigonous-pyramidal involucre; stomata well developed; scales usually large and conspicuous.

3. OXYMITRA.

1. RICCIA (Micheli) L. Sp. Pl. 1138. 1753.

Ricciella A. Br. Flora 4: 756. 1821.

Cryptocarpus Aust. Proc. Acad. Phila. 1869: 231. 1870.

Thallocarpus Lindb. Not. Sallsk. Faun. Fl. Fenn. 13: 377. 1874.

Angiocarpus Trevisan, Mem. Ist. Lomb. 13: 444. 1877.

Gametophyte terricolous or rarely (*R. fluitans*) aquatic, annual or more or less perennial, usually several times dichotomously branched, with linear, ovate, obovate, elliptic, cuneate, or obcordate segments, these commonly with a distinct median sulcus. Basal or costal tissue well developed or much reduced, nearly or wholly destitute of chlorophyl; assimilatory layer consisting of vertical or subvertical columns of cells bounding very narrow air-canals, or

consisting of larger polyhedral or subclavate chambers bounded by unistratose lamellae, the roofs of such chambers often falling in, giving the dorsal surface a spongy or lacunose appearance. Dorsal epidermis commonly appearing more or less areolate or alveolate under the hand-lens, the cells of the primary superficial layer often soon collapsing and more or less disintegrated. Stomata represented by very inconspicuous pores bounded by unmodified or only very slightly modified epidermal cells. Latero-ventral scales hyaline-albescent, brownish, violet, or dark-purple, rarely surpassing the margins of the thallus, sometimes apparently wanting. Margins of thallus, in certain species, usually provided with cilia or bristles. Monoicous or, less commonly, dioicous. Antheridia and archegonia scattered, the antheridia irregularly intermingled with the archegonia in the monoicous species, with occasional tendencies to segregation, both destitute of a special involucre. Calyptra-wall mostly of two layers of cells of which the inner layer is commonly absorbed before maturity of the sporophyte.

Sporophyte-wall unistratose throughout, soon disintegrated. Spores separating at or before maturity, or persistently united in fours (*R. Curtisii*). Accessory sterile cells wanting.

Type species, *Riccia crystallina* L.

Assimilatory layer with more or less wide polyhedral or clavate-polyhedral air-chambers separated by unistratose lamellae. (Species 1-6 = *RICCIELLA*.)

Thallus aquatic or on wet substratum; main segments narrowly linear; spores 65-104 μ in maximum diameter; areolae of outer face 12-25 μ broad.

1. *R. fluitans*.

Thallus terricolous.

Spores separating before maturity.

Spores angular, areolate or ridged.

Spores areolate, at least on outer face.

Areolae of outer face 8-13 μ broad; main segments of thallus oblong, sublinear, or obtusely-quadrate.

Thallus-margins obtuse or subacute; scales rudimentary; spores 50-78 μ in maximum diameter.

2. *R. Sullivantii*.

Thallus-margins commonly thin and submembranous; scales fairly well developed; spores 70-90 μ in maximum diameter.

3. *R. Dussiana*.

Areolae of outer face usually 10-30 μ broad, those in the middle sometimes larger and enclosing a free-ending spur or an isolated tubercle.

4. *R. crystallina*.

Spores marked with short delicate ridges which rarely anastomose; thalli dioicous.

5. *R. Frostii*.

Spores ovoid, ellipsoid, or subglobose, spinulose, 40-65 μ in maximum diameter.

6. *R. membranacea*.

Spores permanently united in fours, the tetrads 90-130 μ in diameter; thalli dioicous. (*THALLOCARPUS*.)

7. *R. Curtisii*.

Assimilatory layer with narrow vertical or subvertical air-canals (or sometimes with polyhedral air-chambers in thallus wings). (*R. Frostii* may sometimes be sought here.)

Thallus-margins naked or showing obvious latero-ventral scales, not ciliate (except in *R. glauca subinermis* and, rarely, *R. arvensis*).

Scales conspicuous, extending considerably beyond the margin, whitish-hyaline; spores 75-126 μ in maximum diameter, obscurely angular, a wing-margin wanting or rudimentary.

8. *R. Austini*.

Scales usually inconspicuous, not reaching the margin, or sometimes slightly exceeding it, especially at or near the thallus-apex.

Dorsal surface of thallus more or less green, not calcified.

Spores angular, distinctly wing-margined.*

Scales whitish-hyaline or brownish, rarely tinged with violet-purple.

Thallus-margins green, hyaline, or occasionally violet; oil-body cells wanting.

Median sulcus narrow and acute; cells of the primary epidermis leaving after their collapse persistent indurated cups.

Main segments 0.75-2 mm. wide; scales small; inner faces of spores densely punctate or bearing short ridges.

9. *R. sorocarpa*.

Main segments 2-3 mm. wide; scales rather large. (Mexican.)

10. *R. Mauryana*.

* Spores of *R. Mauryana*, here provisionally included, have not been seen by the writer and have not been described in detail.

- Median sulcus obtuse, commonly occupying one third or more of the width of the thallus; cells of the primary epidermis leaving after their collapse imperfect cups or irregular vestiges.
- Thalli 6–10 mm. long, the segments mostly 1.5–2.5 mm. wide; antheridial ostioles elevated 75–160 μ ; spores 75–118 μ in maximum diameter; inner faces of spores less strongly areolate than the outer.
- Thalli mostly 3–6 mm. long, the segments mostly 1–1.5 mm. wide; antheridial ostioles inconspicuous, elevated up to 25 μ ; inner and outer faces of spores almost equally areolate-alveolate.
- Thallus-margins commonly yellowish-brown, thin and membranous; oil-body cells usually present in various parts of thallus; antheridial ostioles elevated 100–170 μ .
- Scales blackish-purple; thallus segments 0.75–1.5 mm. wide; antheridial ostioles not at all or only very slightly elevated.
- Spores obscurely or not at all angled (or sometimes distinctly angled in *R. Elliottii*); wing-margins wanting or rudimentary.
- Thalli 1.5–5 mm. long, the segments 0.6–1.25 mm. wide, the margins and sides dark-violet or blackish, papillate; scales dark-violet, small, denticulate-lacerate; spores soon very opaque.
- Thalli 2–20 mm. long, the segments 1–3.5 mm. wide, the margins not papillate.
- Spores at first violet.
- Scales imbricate; spores soon opaque and densely echinulate, the areolae soon obscured.
- Scales small, distant; spores finally violet-brown, areolate-alveolate and trabeculate, the areolae remaining manifest.
- Spores brown.
- Thallus-margins commonly reddish-purple; areolae of spores mostly 10–20 μ wide.
- Thallus-margins blackish-purple; areolae of spores mostly 8–12 μ wide.
- Dorsal surface of thallus chalk-white, calcified.
- Thallus-margins normally bearing a few or many cilia or setae.
- Monoicous; thallus-segments 0.6–2.5 mm. wide; spores 65–140 μ in maximum diameter.
- Cilia 50–400 μ long, none on dorsal epidermis above capsules.
- Antheridial ostioles 60–200 μ high; cilia stout, 75–300 μ long, often curved; median sulcus rather broad, occupying one-third to two-fifths the width of the thallus; inner faces of spores usually nearly smooth.
- Antheridial ostioles 0–30 μ high; cilia slender.
- Cilia 50–150 μ long; median sulcus narrow; inner faces of spores more or less areolate; areolae of outer face mostly 10–13 μ wide.
- Cilia 150–400 μ long; median sulcus broad; inner faces of spores areolate; areolae of outer face mostly 6–10 μ wide.
- Cilia or setae 300–900 μ long, slender, commonly 1–12 on dorsal epidermis above each capsule; spores 90–125 μ in maximum diameter, soon black and very opaque.
- Dioicous; thallus-segments 2–7 mm. wide; cilia stout, 100–325 μ long and 75–150 μ in greatest width; spores 130–190 μ in maximum diameter, soon black and very opaque.

11. *R. glauca*.12. *R. arvensis*.13. *R. Campbelliana*.14. *R. nigrella*.15. *R. violacea*.16. *R. McAllisteri*.17. *R. subplana*.18. *R. Elliottii*.19. *R. dictyospora*.20. *R. albida*.21. *R. Beyrichiana*.22. *R. hirta*.23. *R. californica*.24. *R. trichocarpa*.25. *R. Donnellii*.1. *Riccia fluitans* L. Sp. Pl. 1139. 1753.*Riccia canaliculata* Hoffm. Deuts. Fl. 2: 96. 1796.*Riccia fluitans canaliculata* Roth, Fl. Germ. 3¹: 434. 1800.*Ricciella fluitans* A. Br. Flora 4: 757. 1821.*Riccia eudichotoma* Bisch. Nova Acta Acad. Leop.-Carol. 17: 1068. 1835.

Thalli floating or suspended in water or creeping on moist soil, 1–5 cm. long, repeatedly and regularly dichotomous, carinate-costate, green dorsally and ventrally, the dorsal surface smooth, often wrinkled on drying, occasionally lacunose with age; root-hairs almost wanting in aquatic conditions; main segments narrowly linear, 0.5–1.5 mm. broad; terminal segments oblong to linear, obtuse or subtruncate, emarginate; margins mostly flat, ascending in terri-

colous conditions, 2 or 3 cells thick or more or less unistratose; median sulcus shallow, observable only near apex except in land forms; scales deficient, or, in terricolous forms, rudimentary, sometimes violet; transverse sections often biconvex, mostly 2–4 times as broad as the maximum height; dorsal epidermis unistratose, persistent, occasionally collabent and disintegrated over air-chambers with age, the cells mostly 40–90 μ in maximum diameter in terricolous forms and showing small stomatal pores, in aquatic forms 50–200 μ long and without obvious pores; air-chambers large, elongate-polyhedral, separated by unistratose lamellae and showing 1–3 series in a transverse section. Monoicous; antheridial ostioles elevated 75–150 μ ; capsules (found only in terricolous or semiterricolous conditions) forming hemispheric or subglobose protuberances 450–600 μ in diameter on the ventral surface; spores yellowish-brown, translucent, 65–104 μ in maximum diameter, angular, with a margin 3–8 μ wide, the outer face with rather smooth areolae 12–25 μ broad, the larger often enclosing a free-ending spur or an isolated tubercle, 4 or 5 areolae measuring the width of the face, the inner faces with short free or irregularly anastomosing ridges.

TYPE LOCALITY: Europe.

DISTRIBUTION: Quebec and British Columbia to California; Costa Rica; Cuba; Haïti; Jamaica; cosmopolitan.

ILLUSTRATIONS: Nova Acta Acad. Leop.-Carol. 17: *pl.* 70, *f.* V; 18: *pl.* 24, 25; Leitgeb, Unters. Leberm. 4: *pl.* 1, *f.* 11–15; *pl.* 2, *f.* 1–3; Krypt.-fl. Brand. 1: 79. *f.* 8; Pearson, Hep. Brit. Isles *pl.* 224; Rab. Krypt.-Fl. 6; *f.* 6, 134.

EXSICCATAE: Drummond, So. Mosses 158; Sull. Musci Allegh. 291; Aust. Hep. Bor.-Am. 148; Underw. & Cook, Hep. Am. 41; Macoun, Can. Hep. 76 p.p.; Macoun, Can. Liv. 1.

Familler (Die Lebermoose Bayerns, Denks. Bot. Ges. Regensb. 14: 6–14. *pl.* 1, 2. 1920) has recently treated *Riccia fluitans* L. as a composite, consisting of aquatic conditions of several terrestrial species, basing his distinctions chiefly upon the form and distribution of the air-chambers. *Riccia fluitans*, as described above, is certainly variable, but, in absence of cultural proofs of its composite nature and of its derivation from land forms of very different habit, the present writer prefers to treat it in the conventional fashion.

2. *Riccia Sullivantii* Aust. Proc. Acad. Phila. 1869: 233. 1869.

Riccia fluitans terrestris Aust. Hep. Bor.-Am. 37. 1873.

Riccia fluitans Sullivantii Underw. Bull. Ill. Lab. Nat. Hist. 2: 28. 1884.

Riccia Huebeneriana Underw. Bot. Gaz. 19: 276. 1894. Not *R. Huebeneriana* Lindenb. 1837.

Ricciella Sullivantii Evans, Rhodora 9: 56. 1907.

Thalli terricolous, small or medium-sized, forming rosettes 10–20 mm. in diameter or irregularly gregarious, mostly 3–5 times dichotomous, light-green or darkish-green above, concolorous or rarely purple below and on margins, more or less costate-carinate, the dorsal surface remaining rather smooth or sometimes spongiose-alveolate with age, the branches often widely spreading; main segments oblong or sublinear to obcuneate-quadrate, 0.75–1.5 mm. wide; terminal segments oblong, elliptic, or quadrate-obovate, obtuse or emarginate; margins obtuse or subacute, usually ascending; median sulcus broad and rather shallow, usually well defined; scales rudimentary; transverse sections subelliptic or fusiform, mostly 2–4 times as broad as high; dorsal epidermis unistratose, persistent or sometimes collabent and disintegrated over air-chambers with age, the cells mostly 50–120 μ in maximum diameter; air chambers elongate-polyhedral or claviform, separated by unistratose lamellae and showing 1–3 series in a transverse section. Monoicous; antheridial ostioles elevated 100–175 μ ; capsules usually numerous, forming hemispheric or subglobose protuberances 500–750 μ in diameter on the ventral surface; spores brown or yellowish-brown, 50–78 μ in maximum diameter, angular, with a margin 3–6 μ wide or the margin often cut into crests or papillae or sometimes almost wanting, the outer faces with areolae 8–13 μ broad, 5–8 areolae measuring the width of the face, the angles of the meshes scarcely elevated or often lifted into obtuse or truncate, nearly smooth or cristulate-muriculate papillae 2–3 μ high, the inner faces similarly but a little less strongly marked, sometimes with less perfect areolae.

TYPE LOCALITY: Closter, New Jersey.

DISTRIBUTION: Quebec and Maine to Wisconsin, Missouri, and Florida; Cuba.

EXSICCATAE: Aust. Hep. Bor.-Am. 147, 149; Haynes, Am. Hep. 41.

3. *Riccia Dussiana* Stephani, Symb. Ant. 3: 275. 1902.

Thalli terricolous, small or medium-sized, 5–10 mm. long, rather irregularly gregarious, mostly 2 or 3 times dichotomous, light-green above, concolorous or tinged with violet-purple

below and on margins, costate-carinate, the dorsal surface remaining rather firm and compact; main segments oblong or sublinear, 0.75–1.6 mm. wide; terminal segments similar or shorter, emarginate; margins acute or thin and submembranous, ascending, often undulate-crispate and crenulate-lobulate; median sulcus broad and deep; scales hyaline, fairly well developed but scarcely projecting; transverse sections mostly arcuate-crescentic, 3–6 times as broad as high; dorsal epidermis unistratose, subpersistent, the cells mostly 40–80 μ in maximum diameter; air-chambers polyhedral or claviform, separated by unistratose lamellae and showing 1–3 series in a transverse section. Monoicous; antheridial ostioles elevated 50–160 μ ; capsules moderately numerous, forming hemispheric protuberances 600–700 μ in diameter on the ventral surface; spores brown, 70–90 μ in maximum diameter, angular, with a granulate or crenulate margin 3–7 μ wide, the outer faces with areolae 8–13 μ wide, about 8 areolae measuring the width of the face, the angles of the meshes only slightly elevated, the inner faces similarly but less regularly marked.

TYPE LOCALITY: Fonds St. Denis, Martinique.

DISTRIBUTION: Martinique.

4. *Riccia crystallina* L. Sp. Pl. 1138. 1753.

Riccia Catalinae Underw. Bot. Gaz. 19: 275. 1894.

Riccia Brandegei Underw. Bot. Gaz. 19: 275. 1894.

Ricciella crystallina Warnst. Krypt.-fl. Brand. 1: 80. 1902.

Thalli small to moderately large, 2–6 times dichotomous, forming rosettes 5–20 mm. (rarely 30 mm.) in diameter, or soon irregularly gregarious, usually a light crystalline green or often yellowish-green above, occasionally dark-green or now and then tinged with red-purple or brownish-red, concolorous below, the dorsal surface vesicular-areolate, soon becoming spongiose or lacunose-alveolate, especially on drying; main segments subquadrate-obovate to obcuneate-oblong or linear-oblong, 1–2.5 mm. wide; terminal segments subquadrate-obovate or obcordate, obtuse or subtruncate, emarginate; margins obtuse or subacute, naked, sometimes reddish-purple or brown-red; median sulcus usually rather poorly defined except at apex; scales wanting or rudimentary; transverse sections subelliptic, oblong, or somewhat parabolic, mostly 2–4 times as broad as high, the ventral outline convex or nearly rectilinear; dorsal epidermis soon indeterminate, the cells of the primary stratum subspheric, ellipsoidal, or papilliform, irregularly collapsing or subpersistent, they or their successors finally 40–110 μ in maximum diameter; air-chambers elongate-polyhedral, separated by unistratose lamellae, and showing 2–4 vertical series in a transverse section. Monoicous (rarely dioicous?); antheridial ostioles elevated 75–250 μ ; capsules moderately numerous, often rather long included; spores at first yellowish-brown, soon darkening and often nearly opaque, 60–110 μ in diameter, distinctly angular, with a granulate-papillate, often crenulate-cristulate margin mostly 3–10 μ wide, the outer face marked with somewhat imperfectly formed areolae usually 10–30 μ wide or those in the middle sometimes larger (30–45 μ) and enclosing a free-ending spur or an isolated tubercle, the inner faces with tubercles, or short, free, irregular ridges, or sometimes with imperfect areolae, the older spores commonly tuberculate-papillate in profile.

TYPE LOCALITY: Florence, Italy.

DISTRIBUTION: Vermont to Florida, Texas, California, Oregon, and Alberta; Lower California; Bahamas; Cuba; also in Trinidad and in Europe.

ILLUSTRATIONS: Nova Acta Acad. Leop.-Carol. 18: pl. 22; Leitgeb, Unters. Leberm. 4: pl. 1, f. 5–8; pl. 2, f. 7–9; Pearson, Hep. Brit. Isles pl. 217; Krypt.-fl. Brand. 1: 79. f. 6; Rab. Krypt.-Fl. 6: f. 137.

EXSICCATAE: Clements, Crypt. Form. Colo. 615.

5. *Riccia Frostii* Aust. Bull. Torrey Club 6: 17. 1875.

Riccia Watsoni Aust. Bull. Torrey Club 6: 17. 1875.

Riccia Beckeriana Stephani, Bull. Herb. Boiss. 6: 374. 1898.

Thalli small to medium-sized, 2–6 times dichotomous, forming compact rosettes 4–15 mm. in diameter, or at length irregularly gregarious, dark-green, grayish-green, or red-purple above, concolorous below, the dorsal surface obscurely reticulate or substriate in younger

parts, soon becoming spongiöse or lacunose, especially on drying; root-hairs (always?) smooth-walled; main segments obovate to linear, 0.5–2 mm. wide; terminal segments obovate, oblong, or linear, obtuse, obscurely emarginate; margins rounded-obtuse to subacute, naked, often red-purple, commonly plane; median sulcus usually well defined only at apex; scales wanting or very rudimentary; transverse sections oblong or subelliptic, mostly 1.5–3 times as broad as high, 14–20 cells thick in median parts, the ventral outline lightly convex; dorsal epidermis rather indeterminate, the cells of the primary stratum subconic, obtuse, or flat-topped, 40–70 μ broad, mostly broader than high, subpersistent or collapsing irregularly; air-chambers sometimes narrow and columnar, with occasionally transverse or oblique partitions, but, for the most part, elongate-polyhedral, separated by unistratose lamellae, and showing 2–4 vertical series in a transverse section, but only 1 or 2 series in longitudinal section. Dioicous; antheridial plants small, often red-purple; antheridial ostioles elevated 75–130 μ ; capsules usually numerous, their covering soon ruptured, exposing the spores; spores brown, 40–65 μ in maximum diameter, angular, with granulate-crenulate margin 2–3 μ wide, the outer face often collabent, marked with numerous short delicate wavy rarely anastomosing ridges, commonly showing in profile minute crowded obtuse or truncate papillae about 1 μ high, the areolae when formed only 1.5–3 μ wide, the inner faces similarly but a little less strongly marked.

TYPE LOCALITY: Nevada.

DISTRIBUTION: Vermont to Montana, Washington, and California; Lower California; reported also from Europe and Asia.

ILLUSTRATIONS: Rab. Krypt.-Fl. 6: f. 138; Bull. Torrey Club 37: 75. f. 4; 76. f. 5; 77. f. 6; Ann. Bot. 27: pl. 37, 38.

EXSICCATAE: Drummond, So. Mosses 155 (as *R. crystallina*); Underw. & Cook, Hep. Am. 63 (as *R. crystallina*).

Though the air-chambers in the mature condition of this species are dominantly of the *Ricciella* type, the species sometimes shows in the same individual an association of the two types of air-chamber which have been supposed to be characteristic of *Riccia* and *Ricciella* respectively.

6. *Riccia membranacea* Gottsche & Lindenb.;

G. L. N. Syn. Hep. 608. 1846.

Riccia tenuis Aust. Proc. Acad. Phila. 1869: 233. 1870.

Ricciella membranacea Evans, Rhodora 12: 196. 1910.

Thalli thin and membranous, rather small, 3–7 mm. long, usually once or twice dichotomous, irregularly gregarious, commonly dark-green, concolorous below, the dorsal surface smooth or more or less wrinkled on drying; main segments 2–4 mm. broad, rather obscurely costate; terminal segments obovate, obcordate, or suborbicular, retuse or emarginate-bifid; margins commonly unistratose in younger parts for a width of 1–5 cells; median sulcus scarcely manifest except at apex; scales wanting or rudimentary; transverse sections sublinear or narrowly attenuate-elliptic, 8–12 times as broad as the maximum height, the dorsal outline nearly rectilinear, the ventral slightly curved; dorsal epidermis unistratose, persistent, the cells mostly 40–65 μ in maximum diameter in surface view or more elongate and sometimes 100–140 μ , close-fitting, with occasional large and irregular, often subelliptic openings above air-chambers, the chambers large, irregularly elongate-polyhedral, separated by unistratose lamellae and showing one or two series on a transverse section, the basal tissue mostly of only 1–3 layers of cells. Monoicous; antheridial ostioles elevated 50–160 μ ; capsules moderately numerous, 0.35–0.48 mm. in diameter, protuberant on the lower surface; spores brown, 40–65 μ in maximum diameter, ovoid, ellipsoid, or subglobose, sometimes obscurely angled, destitute of a wing-margin, thickly covered with obtuse, truncate, or subacute spines 2–3 μ long.

TYPE LOCALITY: Mexico.

DISTRIBUTION: Connecticut to Ohio and Louisiana; Veracruz; Cuba; Porto Rico.

EXSICCATAE: Aust. Hep. Bor.-Am. 150; Haynes, Am. Hep. 73.

7. *Riccia Curtisii* T. P. James; (Aust. Proc. Acad. Phila. 1869: 231, as synonym. 1870) Stephani, Bull. Herb. Boiss. 6: 369. 1898.

Cryptocarpus Curtisii Aust. Proc. Acad. Phila. 1869: 231. 1870.

Thallocarpus Curtisii Lindb.; Aust. Bull. Torrey Club 6: 21. 1875; 305. 1879.

Angiocarpus Curtisii Trevisan, Mem. Ist. Lomb. 13: 444. 1877.

Female thalli small to moderately large, 2–20 mm. long, 1–4 times dichotomous, and flabellately disposed or now and then subpinnately dichotomous, forming rosettes 20–30 mm. in diameter, the male thalli usually smaller, often minute, all light-green or yellowish-green above, concolorous below, the dorsal surface papulose or ridged, soon spongiöse or lacunose; root-hairs of two kinds or sometimes all(?) smooth-walled; main segments oblong or subquadrate, 2–3 (–4) mm. wide; terminal segments subquadrate or oblong, rounded-obtuse or subtruncate, commonly emarginate; margins often more or less undulate-crisped or crenate in younger parts, sometimes unistratose for a width of 1–4 cells; median sulcus rather broad and indistinct; scales wanting or rudimentary; transverse sections oblong, concavo-convex, subcrescentic, or sometimes almost semiorbicular, mostly 2–4 times as broad as high; dorsal epidermis soon interrupted and rather indeterminate, its cells subpersistent, 50–100 μ in maximum diameter in surface view or more elongate and sometimes 150–260 μ , the epidermis showing one or occasionally more large or small, subelliptic or irregularly polygonal openings for each subjacent air-chamber, these chambers ovoid, soon long-clavate or elongate-polyhedral, separated by unistratose lamellae and showing two or three series in a transverse section, the basal tissue mostly of 2–6 layers of cells. Dioicous; antheridial ostioles elevated 75–150 μ ; capsules included, 0.6–0.8 mm. in diameter; spores permanently united in fours, yellowish-brown, darkening with age, the tetrads 90–130 μ in diameter, their surfaces sometimes, with exception of the contact sinuses, thickly beset with obtuse or truncate verruculae 2–3 μ high or with obtuse, truncate, or subacute spinules 3–6 μ high, these seated at the angles of an obvious or scarcely visible basal reticulum.

TYPE LOCALITY: North Carolina.

DISTRIBUTION: North Carolina to Florida and Texas.

ILLUSTRATIONS: Bull. Torrey Club 43: pl. 4; 47: pl. 13.

EXSICCATAE: Underw. & Cook, Hep. Am. 43.

8. *Riccia Austini* Stephani, Bull. Herb. Boiss. 6: 336. 1898.

Riccia lamellosa Underw. Bull. Ill. Lab. Nat. Hist. 2: 24. 1884. Not *R. lamellosa* Raddi, 1818.

Riccia lamellosa americana M. A. Howe, Bull. Torrey Club 25: 189. 1898.

Riccia americana M. A. Howe, Mem. Torrey Club 7: 24. 1899.

Thalli medium-sized, mostly 6–15 mm. long, 1–4 times dichotomous, subradiate, often forming compact, more or less imbricate masses, pale-green and regularly reticulate above, concolorous below; main segments oblong, 2.5–4 mm. in greatest width; terminal segments oblong to obcordate, mostly obovate, obtuse or emarginate; margins acute, thin-membranous, or subulate, ascending, or, when dry, often erect-connivent; median sulcus acute, narrow, and deep toward apex; scales large, colorless, obtuse, subundulate, patent or somewhat imbricate, extending considerably beyond the margins; transverse sections subquadrate, oblong, or somewhat parabolic, 1.5–3 (–4) times as broad as high, 14–30 cells thick in median parts, the ventral outline rounded or subrectilinear; dorsal epidermis 2-stratose, the cells of the primary stratum subglobose or ovoid-papilliform, soon collapsing and leaving irregular or cup-like vestiges, the cells of the succeeding stratum 30–75 μ broad, the cells of two or three subjacent strata sometimes decolorate. Monoicous; antheridial ostioles scarcely elevated or occasionally up to 150 μ high; capsules with spongiöse covering protuberant, finally erumpent; spores brown, 75–126 μ in maximum diameter, obscurely angular, a wing margin wholly wanting or rudimentary, the outer face with clearly defined areolae mostly 12–16 μ wide, commonly showing in profile low, often obscure papillae 1–4 μ high, the inner faces with smaller much less distinct areolae or simply marked with low irregular vermicular ridges.

TYPE LOCALITY: Near Closter, New Jersey.

DISTRIBUTION: Connecticut to Texas and California.

ILLUSTRATIONS: Mem. Torrey Club 7: pl. 90.

EXSICCATAE: Aust. Hep. Bor.-Am. 140; Haynes, Am. Hep. 1, 97.

9. *Riccia sorocarpa* Bisch. Nova Acta Acad. Leop.-
Carol. 17: 1053. 1835.

Riccia minima L. Sp. Pl. 1139, in part. 1753.

Thalli rather small to medium-sized, 4–9 mm. long, 1–4 times dichotomous, at first subradiate, forming later irregularly gregarious patches, minutely, regularly, and compactly reticulate above, sometimes nearly smooth on drying, of a bright, clear, subcrystalline light-green above when living, of a lighter green when dry, concolorous below; main segments oblong or obcuneate-oblong, 0.75–2 mm. wide; terminal segments oblong, subacute; margins usually sharply acute, naked, often hyaline and submembranous, rarely violet, commonly ascending, often incurved on drying; median sulcus acute; scales small, whitish or hyaline, often reaching the margin at or near the apices; transverse sections subquadrate or somewhat parabolic, mostly 1–2, less often 2–4, times as broad as high, about 25 cells thick in median parts, the ventral outline strongly convex or subcarinate; dorsal epidermis 2- or 3-stratose, the cells of the primary stratum at first papilliform, the lower portions of their lateral walls becoming thickened and the upper soon vanishing, leaving persistent cups 30–75 μ broad attached to the likewise thick-walled cells of the subjacent stratum. Monoicous; antheridial ostioles short-cylindric, about 80 μ high; capsules usually numerous, sometimes emergent-protuberant with age; spores dark-brown, 67–100 μ (mostly 70–90 μ) in maximum diameter, angular, with a brownish granulate-papillate and crenulate, usually interrupted margin 3–6 μ broad, the outer face areolate, showing in profile papillae mostly 3–6 μ long, the areolae mostly 6–10 μ wide, the inner faces densely and rather minutely punctate or furnished with very short and numerous low ridges which do not form areolae.

TYPE LOCALITY: Near Heidelberg, Germany.

DISTRIBUTION: Massachusetts to Washington, California, and Alabama; reported from Greenland; also in Europe, northern Asia, and northern Africa.

ILLUSTRATIONS: Nova Acta Acad. Leop.-Carol. 17: *pl.* 71, *f.* II; Pearson, Hep. Brit. Isles *pl.* 218; Krypt.-fl. Brand. 1: 74. *f.* 4; Rab. Krypt.-Fl. 6: *f.* 131.

EXSICCATAE: Aust. Hep. Bor.-Am. 139; Underw. & Cook, Hep. Am. 139 (as *R. glauca*).

10. *Riccia Mauryana* Stephani, Bull. Herb. Boiss. 6: 327. 1898.

Thalli medium-sized, 10–12 mm. long, 2 or 3 times furcate, with wide-angled dichotomies, minutely and compactly reticulate above, nearly smooth on drying, light-green above, concolorous below; main segments oblong or linguiform, 2–3 mm. wide; terminal segments similar or shorter, obtuse; margins acute, ascending; median sulcus narrow, deep, and acute; scales rather large, whitish or hyaline, entire, reaching the margin or slightly projecting toward the apex; transverse sections subquadrate-trapezoidal with deep reëntrant angle on dorsal side, mostly 2 or 3 times as broad as high, about 25 cells thick in median parts, the ventral outline convex or somewhat rectilinear; dorsal epidermis 2- or 3-stratose, the cells of the primary stratum soon collapsing, leaving rather persistent shallow cups 20–40 μ wide, these commonly with indurated bases. Dioicous (?); antheridial ostioles not elevated; spores (according to Stephani) 85 μ in diameter, blackish, densely and minutely papillate.

TYPE LOCALITY: Cerro de Guadalupe (near City of Mexico?), Mexico.

DISTRIBUTION: Mexico.

11. *Riccia glauca* L. Sp. Pl. 1139. 1753.

Thalli medium-sized, 6–10 mm. long, 2–4 times dichotomous, at first subradiate, later confluent and irregularly gregarious, reticulate, light-green or subglaucous above, concolorous or rarely blackening below; main segments oblong or obcuneate, mostly 1.5–2.5 mm. wide; terminal segments subquadrate, linguiform, or obovate, obtuse, subtruncate, or emarginate-retuse; margins acute or subobtuse, mostly rather thin, usually ascending, naked; median sulcus broad and obtuse, occupying one third or more of the width of the thallus, soon vanishing toward base; scales inconspicuous, colorless or rarely darkening; transverse sections oblong, subelliptic, or crescentic, mostly 4–5 times as broad as high, 15–25 cells thick in median parts, the ventral outline lightly convex or nearly rectilinear; dorsal epidermis 2-stratose, the cells of the primary stratum hemispheric-ellipsoid or ovoid, obtuse or conic-mammillate,

soon collapsing and leaving imperfect cups or irregular vestiges, the cells of the succeeding stratum mostly 30–80 μ broad, commonly broader than high. Monoicous; antheridial ostioles elevated 75–160 μ ; capsules usually numerous, long included; spores brown, 75–118 μ in maximum diameter, angular, with a smooth or subgranulate, more or less crenulate margin 5–13 μ wide, the outer face areolate, showing in profile obtuse papillae 1–5 μ long, the areolae mostly 8–13 μ wide, the inner faces similarly but less strongly marked.

TYPE LOCALITY: England.

DISTRIBUTION: California and Texas; also in Europe.

ILLUSTRATIONS: Dill. Hist. Musc. *pl.* 78, *f.* 10; Nova Acta Acad. Leop.-Carol. 18: *pl.* 19; Krypt.-fl. Brand. 1: 74. *f.* 1; 79. *f.* 1; Rab. Krypt.-Fl. 6: *f.* 5, 97, 123a.

Riccia glauca subinermis (Lindb.) Warnst. Krypt.-fl. Brand. 1: 70. 1902. *Riccia subinermis* Lindb. Medd. Soc. Faun. Fl. Fenn. 6: 264. 1881. Margins bearing a few, usually short and stout, cilia. DISTRIBUTION: Missouri, Arizona, California, and Oregon; also in Europe. ILLUSTRATION: Rab. Krypt.-Fl. 6: *f.* 123b.

12. *Riccia arvensis* Aust. Proc. Acad. Phila. 1869: 232. 1870.

Thalli rather small, mostly 3–6 mm. long, and irregularly gregarious, or forming rosettes 5–10 mm. in diameter, usually 2 or 3 times dichotomous, somewhat obscurely reticulate above, often minutely furfuraceous on drying, dull grayish-green, the margins and sides occasionally tinged with violet-purple; main segments oblong or obcuneate-subquadrate, 0.6–2 (mostly 1–1.5) mm. wide; terminal segments subquadrate, or subquadrate-ovate, rounded-obtuse, often emarginate; margins subacute or obtuse, often somewhat alate, naked, or, very rarely, bearing occasional short rather flaccid cilia; median sulcus often narrow at apex, broadening behind to a shallow channel occupying about one third the width of thallus, becoming obsolete toward base; scales small, not reaching margins, hyaline or sometimes tinged with violet-purple; transverse sections concavo-parabolic or canaliculato-trapezoidal, becoming subelliptic in the older parts, mostly 2–4 times as broad as high, 16–25 cells thick in median parts, the cells chlorophyllose almost or quite to the ventral epidermis, the ventral outline rounded or more or less rectilinear; dorsal epidermis 1- or 2-stratose, the cells of the primary stratum rounded-obtuse or conic-mammillate, soon collapsing and leaving irregular vestiges, the cells of the succeeding stratum subglobose, ellipsoid, or polyhedral, 35–70 μ broad, often broader than high. Monoicous; antheridial ostioles inconspicuous, sometimes elevated 25 μ ; capsules usually numerous, often crowded, long included; spores dark-brown, 68–115 μ in maximum diameter, angular, with a granulate-papillate, crenulate, or lobulate-cristulate margin 3–12 μ wide, the outer and inner faces almost equally areolate-alveolate, the areolae mostly 10–15 μ wide, the outer face showing in profile granulate crests or truncate papillae 3–5 μ high, the inner faces similarly or a little less strongly marked.

TYPE LOCALITY: Closter, New Jersey.

DISTRIBUTION: New Hampshire to Ontario, Indiana, and Texas.

ILLUSTRATIONS: Bull. Torrey Club 47: *pl.* 12, *f.* 1–6.

EXSICCATAE: Aust. Hep. Bor.-Am. 141; Haynes, Am. Hep. 2, 98.

13. *Riccia Campbelliana* M. A. Howe, Mem. Torrey Club 7: 26. 1899.

Thalli medium-sized or rather large, 4–18 mm. long, once or twice or occasionally three times dichotomous, rarely subradiate, loosely gregarious, light- or brownish-green and reticulate above, brown or nearly concolorous below or very rarely blackening, often subcarinate; main segments oblong or linear-oblong, 1–3 mm. (mostly 1.5–2 mm.) wide; terminal segments oblong or obovate, obtuse, less commonly subacute; margins thin, naked, membranous, commonly yellowish-brown, now and then abruptly winged, on drying usually ascending, erect, or inflexed-connivent; median sulcus acute, often obscure toward base; scales brown or nearly colorless, usually inconspicuous, but sometimes slightly exceeding the margin at apex; transverse sections (without margins) subquadrate or oblong, and including margins, 2–5 (mostly 2.5) times as broad as high, 25–35 cells thick in median parts, the ventral outline rounded; dorsal epidermis unistratose, the cells of the primary stratum large, 25–80 μ broad, elliptic-oblong, mostly higher than broad, long-persistent; oil-body cells usually numerous.

Monoicous; antheridial ostioles prominent, conic-cylindric, 100–170 μ high; capsules commonly numerous, finally erumpent and exposing the spores; spores finally yellowish-brown, 75–108 μ (mostly 90–100 μ) in maximum diameter, distinctly angular, with a minutely granulate or nearly smooth margin 3–6 μ in width, the outer face lightly papillate or nearly smooth in profile, marked with close sinuous ridges which rarely form complete meshes, the imperfect areolae mostly 4–7 μ wide, the inner faces similarly but less strongly marked.

TYPE LOCALITY: Near Stanford University, California.

DISTRIBUTION: Texas and California.

ILLUSTRATIONS: Mem. Torrey Club 7: *pl.* 91, *f.* 1–15.

14. *Riccia nigrella* DC. Fl. Fr. 6: 193. 1815.

Riccia minima L. Sp. Pl. 1139, in part. 1753.

Riccia aggregata Underw. Bot. Gaz. 19: 275. 1894.

Thalli small to medium-sized, 2–8 mm. long, 1–4 times dichotomous, at first subradiate, later commonly irregularly gregarious, dark-green, somewhat polished and closely reticulate above, dark-purple or nearly black (rarely decolorate) beneath; main segments at first obovate, finally linear or linear-obcuneate, 0.75–1.5 mm. wide; terminal segments obcuneate-oblong or elliptic-obovate, obtuse or subacute; margins often brownish, naked, acute or slightly membranous, becoming rather obtuse in older parts, commonly erect-connivent on drying; median sulcus narrow and acute toward apex, becoming obtuse and finally obsolescent in older parts; scales blackish-purple and nitent (rarely decolorate), transverse, semi-orbicular, not exceeding the margin; transverse sections subquadrate-semiorbicular in younger parts, subquadrate or oblong in the older, 1–2.5 (mostly 1.5–2) times as broad as high, mostly 18–25 cells thick in median parts, the ventral outline almost rectilinear, slightly convex toward apex; dorsal epidermis unistratose, its cells lightly protuberant, subquadrate in vertical section, 25–55 μ broad, often broader than high, filled with a transparent and colorless or slightly grumous, somewhat refringent fluid (reacting strongly to iron-haematoxylin stain), the cells collapsed and disintegrated only in the oldest parts of the thallus. Monoicous; antheridial ostioles not at all or only very slightly elevated; capsules usually numerous, often crowded near bases of segments, the long intact, usually light-brown covering commonly with a purple spot about the exerted archegonium-neck; spores brown, becoming darker and more opaque with age, 60–90 μ in maximum diameter, angular, with a minutely granulate or nearly smooth, sometimes interrupted margin 3–6 μ wide, the outer face irregularly areolate, or sinuous-ridged, often showing in profile obtuse or truncate papillae 2–4 μ long, the commonly imperfect areolae 3–10 μ wide, the inner faces rather more regularly areolate, with low, thick-walled, scarcely papillate meshes.

TYPE LOCALITY: Near Montpellier, France.

DISTRIBUTION: Texas and California; reported by Austin from Pennsylvania and by Underwood from New York; also in Europe.

ILLUSTRATIONS: Nova Acta Acad. Leop.-Carol. 18: *pl.* 29; Rab. Krypt.-Fl. 6: *f.* 133.

EXSICCATAE: Aust. Hep. Bor.-Am. 140*b*; Underw. & Cook, Hep. Am. 165.

15. *Riccia violacea* M. A. Howe, Ann. Mo. Bot.

Gard. 2: 51. 1915.

Thalli small, 1.5–5 mm. long, simple or 1–4 times dichotomous, irregularly gregarious, rather obscurely and finely reticulate and dark-green above, dark-violet or blackish at margins and on sides, this color encroaching on upper surface here and there; main segments oblong-obovate or linguiform, 0.6–1.25 mm. wide, the apices obtuse or emarginate; margins obtuse or rounded, commonly erect-connivent or inflexed on drying, bearing, especially toward the apex and often low on the sides, numerous or occasional violet or sometimes hyaline conic or subcylindric acute or obtuse papillae 20–110 μ long and 25–45 μ broad at base; median sulcus shallow or obsolete except at apex; scales very short or rudimentary, dark-violet, rarely overlapping, commonly divided into a series of small irregular often tooth-like laciniae, each consisting of only a few cells; transverse sections 1.5–2 times as broad as high, plano-convex, flattened-semiorbicular, or occasionally biconvex; dorsal epidermis 2-stratose, the

cells of the primary stratum thin-walled, subhemispheric or mammiform, soon collapsing and leaving inconspicuous vestiges, the cells of the secondary superficial stratum mostly 18–30 μ broad. Dioicous (?); antheridial ostioles elevated 20–150 μ , often violet; spores soon fuscous and very opaque, 65–105 μ in maximum diameter, obscurely angled or flattened-sphaeroid, destitute of wing-margins, finely, irregularly, and almost uniformly areolate over the whole surface, the areolae 3–8 μ wide, soon very obscure and the spores commonly appearing minutely and densely verruculose, the verruculae obtuse or truncate, finally 2–4 μ high.

TYPE LOCALITY: Mona Island, near Porto Rico.

DISTRIBUTION: Sonora and Durango; Bahamas; Cuba; Porto Rico.

ILLUSTRATIONS: Bryologist 20: *pl.* 3, *f.* 1.

16. *Riccia McAllisteri* M. A. Howe, Bryologist 20: 35. 1917.

Thalli medium-sized, 5–8 mm. long, 2 or 3 times rather divergently forking, often forming densely gregarious more or less radiating masses, regularly reticulate above, bright-green when living, often whitish-green or yellowish-green with age or on drying, violet-purple or sometimes decolorate at margins and on sides; main segments oblong or oblong-obovate, 1.5–2.5 mm. wide; terminal segments ovate, subquadrate, or somewhat obcordate, rounded-obtuse or subacute; margins acute, ascending, their edges hyaline or violet and unistratose for a width of one or two cells; median sulcus acute and sharply defined in anterior parts, becoming obscure in the posterior; scales entire, reddish-violet, claret-colored, or sometimes decolorate, imbricate, slightly exceeding the margins; transverse sections of the thallus mostly 2–3 times as broad as high, 18–25 cells thick in median parts, the ventral outlines rounded-convex or occasionally somewhat flattened; dorsal epidermis of two (or three) layers of cells, the cells of the primary stratum mostly mammiform-apiculate, soon collapsing and leaving rather inconspicuous vestiges, the cells of the secondary superficial stratum mostly 26–78 μ broad, these and the underlying cells in very distinct and regular rows when viewed from above. Monoicous; antheridial ostioles elevated 50–160 μ , often violet; capsules usually numerous, soon exposed, the spores lying in long conglobate masses at the bottom of a deep widely open pit or trough; spores at first violet or violet-brown, soon violet-black and opaque, 78–132 μ in maximum diameter, ellipsoid, ovoid, subspheric, or obscurely tetrahedral, wholly destitute of wing-margins, at first almost uniformly areolate over the whole surface, the areolae mostly 7–15 μ in diameter, soon obscure, and the spores finally appearing densely echinulate, the spinulae 5–11 μ long, truncate or obtuse, or occasionally subacute, sometimes cristate-furcate.

TYPE LOCALITY: Granite Mountain, Texas.

DISTRIBUTION: Missouri, Nebraska and Texas.

ILLUSTRATION: Bryologist 20: *pl.* 3, *f.* 2.

17. *Riccia subplana* Stephani, Symb. Ant. 3: 275. 1902.

Riccia guadalupensis Stephani, in herb.

Thalli medium-sized, 4–15 mm. long, forming rosettes or irregularly gregarious, 2 or 3 times furcate, regularly reticulate and whitish-green above (when dry), concolorous below or more or less tinged with violet-purple at and near the margins; main segments oblong or oblong-obovate, 1.5–3.5 mm. wide; terminal segments similar, rounded-obtuse, emarginate; margins acute or submembranous, ascending; median sulcus rather acute and well defined in anterior parts; scales small, mostly 2–4 cells broad, widely spaced, now and then slightly exceeding the margins, commonly violet-purple; transverse sections of the thallus arcuate-semiorbicular to arcuate-subfusiform, 2–6 times as broad as high, 15–20 cells thick in median parts; dorsal epidermis 2-stratose, the cells of the primary stratum hemispheric or dome-shaped, soon collapsing and leaving inconspicuous vestiges, the cells of the succeeding stratum mostly 40–75 μ broad, in rather distinct and regular rows when viewed from above. Monoicous; antheridial ostioles elevated 75–160 μ ; capsules usually long included; spores at first tinged with violet, soon violet-brown, 80–117 μ in maximum diameter, subspheric or ellipsoid, destitute of wing-margins, almost uniformly areolate-alveolate over the whole surface, the

areolae mostly 10–20 μ broad, remaining distinct, the angles of the lamellae commonly developing obtuse or truncate trabeculae 6–13 μ high.

TYPE LOCALITY: Martinique.

DISTRIBUTION: Guadeloupe and Martinique.

18. *Riccia Elliottii* Stephani, Bull. Herb. Boiss. 6: 324. 1898.

Riccia Breutelii Hampe; Stephani, Bull. Herb. Boiss. 6: 325. 1898

Riccia Brittonii M. A. Howe, Ann. Mo. Bot. Gard. 2: 50. 1915.

Riccia Gaumeri Underw. in herb.

Thalli varying from small to rather large, 2–20 mm. long, occasionally simple, more commonly 1–3 times dichotomous, irregularly gregarious, light-green or dark-green and conspicuously alveolate-reticulate above, concolorous or brownish below, or very often tinged with reddish-purple below, on the margins, and now and then on the dorsal surface; main segments oblong-elliptic, oblong-obovate, or sublinear, 1–3 mm. wide; terminal segments oblong-elliptic, obovate, or sublinear, rounded-obtuse or subacute; margins thin and acute or submembranous, occasionally becoming scarious-albescent, commonly unistratose for a width of 1 or 2 cells, often crenulate-undulate, plane, ascending, or deflexed; median sulcus deep and acute except in older parts; scales small, reddish-purple, hyaline, or hyaline-tipped, sometimes slightly exceeding the margins; transverse sections semiorbicular to arcuate-subfusiform, mostly 1.5–4 times as wide as high, 16–22 cells thick in median parts; dorsal epidermis 2-stratose, the cells of the primary stratum cylindric-domeshaped or subhemispheric, soon collapsing, leaving shallow slightly indurated more or less persistent cup-like vestiges. the cells of the succeeding stratum 26–52 μ in maximum diameter in surface view. Monoicous; antheridial ostioles usually 50–150 μ high, sometimes scarcely elevated; capsules moderately abundant; spores brown, becoming subopaque, 78–140 μ in maximum diameter, rather obscurely or sometimes distinctly angled, often flattened, the margins narrow and poorly developed, or, more often, wholly wanting, the surfaces almost uniformly areolate, or in the more angular conditions, the inner faces less regularly and less strongly marked, the areolae mostly 10–20 μ wide, showing in profile (at least the outer) obtuse or truncate papillae 3–5 μ high.

TYPE LOCALITY: Dominica (type, Hep. Dom. Elliottianae 984).

DISTRIBUTION: Yucatan; Cuba, Mona Island, Porto Rico, St. Thomas, St. Jan, St. Kitts, and Dominca; also in Trinidad.

19. *Riccia dictyospora* M. A. Howe, Bull. Torrey

Club 28: 163. 1901.

Thalli medium-sized, 4–10 mm. long, simple or once or twice dichotomous, irregularly gregarious, reticulate and light-green above or sometimes darkening, with a narrow blackish-purple border; main segments oblong, long-obovate, or rarely sublinear, 1–2 mm. wide, the apices subacute or obtuse; margins ascending, thin, submembranous, more or less crenate-undulate; median sulcus acute and rather sharply defined toward the apex; scales entire, blackish-purple, slightly exceeding the margins; transverse sections 1.5–3 times as broad as high, concavo-parabolic, becoming plano-convex; dorsal epidermis 2-stratose, the cells of the primary stratum thin-walled, dome-shaped or oval-papilliform, very soon collapsing and disintegrated or leaving rather obscure cup-like vestiges, the cells of the secondary superficial stratum mostly 20–42 μ broad; oil-body cells usually abundant. Monoicous; antheridial ostioles often slightly elevated, 0–50 μ high; spores soon exposed, brown, rather translucent, 90–135 μ in maximum diameter, scarcely angled, somewhat flattened, wholly destitute of wing-margins, almost uniformly areolate over the whole surface, papillate-echinulate in profile, the papillae truncate or obtuse, 2–9 μ long, the areolae of the outer face 8–12 μ wide, those of the inner faces slightly larger and less regular, the boundaries of the areolae, especially those of the inner faces, sometimes broken into isolated, close-set papillae or short ridges.

TYPE LOCALITY: Athens, Georgia.

DISTRIBUTION: Connecticut, Georgia, and Texas.

ILLUSTRATIONS: Bull. Torrey Club 47: pl. 11, f. 1–5.

20. *Riccia albida* Sull.; Aust. Proc. Acad.

Phila. 1869: 231. 1870.

Thalli small, mostly 2–4 mm. long, 1–3 times dichotomous, irregularly gregarious, chalk-white and more or less calcified, alveolate-reticulate or spongiose above, both when living and when dried, the margins and sides white or albescent; main segments oblong, cuneate-oblong, or subquadrate, 0.7–1.1 mm. wide; terminal segments quadrate or subquadrate-ovate, obtuse; margins obtuse and rounded, naked or minutely papillate; median sulcus narrow and rather acute, occupying one-sixth to one-tenth the width of the thallus, persistent; scales minute (invisible in ordinary examination); transverse sections subelliptic or semiorbicular, mostly 1.5–2 times as broad as high, 18–24 cells thick in median parts, the cells of 1–6 dorsal layers decolorate with more or less calcified walls, the air-canals of the decolorate stratum often enlarged; cells of the primary stratum of the dorsal epidermis persistent, rounded-obtuse, truncate, or often mammillate or apiculate, 26–40 μ broad, extremely variable in form. Dioicous(?); antheridial ostioles scarcely elevated; spores (mature?) yellowish-brown, 65–85 μ in maximum diameter, obscurely angular, wing-margins wanting, imperfectly developed, or appearing only as bosses at the four main angles, all faces nearly smooth or showing occasionally low irregular wrinkles or warts, the extine readily delaminating.

TYPE LOCALITY: "Texas."

DISTRIBUTION: Texas (Uvalde, McAllister).

21. *Riccia Beyrichiana* Hampe; Lehm. Pugill. 7: 1. 1838.*Riccia Lescuriana* Aust. Proc. Acad. Phila. 1869: 232. 1870.*Riccia Lesquereuxii* Stephani, Bull. Herb. Boiss. 6: 324. 1898.

Thalli medium-sized or rather large, 5–10 mm. long, mostly 1–4 times dichotomous, often with wide-angled (30°–90°) forkings, forming rosettes or gregarious, light-green and reticulate above, concolorous below or commonly tinged with red-purple on sides and at margins, now and then subcarinate; main segments linear-obcuneate, or sometimes nearly obcordate, 1–2.5 mm. wide; terminal segments ovate-elliptic to oblong, subacute; margins abruptly ascending, often incurved on drying, somewhat incrassate, though commonly subacute in cross-section, usually bearing in a single or double series a few stout, obtuse or sharp-pointed, often curved, smooth or minutely granulate cilia 75–300 μ long, or the cilia sometimes deficient; median sulcus flat-bottomed and rather broad, occupying about one-third to two-fifths the width of the thallus, narrowed and apparently closed in front by convergence of margins; scales few, apico-ventral, usually very inconspicuous, hyaline, whitish, or sometimes red-purple; transverse sections mostly 2–4 times as broad as high, concavo-convex, showing much elevated and sometimes inflexed margins towards apex and becoming plano-convex in older parts; dorsal epidermis becoming more or less 2- or 3-stratose, the cells of the primary stratum large, thin-walled, dome-shaped, ovoid, obovoid, or subhemispheric, 38–65 μ broad, soon collapsed and disintegrated, or sometimes leaving obscure and irregularly persistent cups, the 1–3 subjacent irregular layers usually composed of enlarged, hyaline, or subvacuous cells. Monoicous; antheridial ostioles prominent, 60–200 μ high; capsules with a naked, sometimes purple, thallus-covering; spores brown, becoming fuscous and sometimes opaque, (65–) 75–130 (–140) μ in maximum diameter, angular, or occasionally flattened, with a slightly granulate more or less interrupted or deficient margin 3–12 μ in width, the outer face strongly areolate, nearly smooth or rather obscurely papillate in profile, the papillae truncate or obtuse, sometimes cristate-furcate, the areolae mostly 10–18 μ wide, the inner faces nearly smooth or now and then very faintly and irregularly areolate.

TYPE LOCALITY: Between Jefferson and Gainesville, Georgia.

DISTRIBUTION: Massachusetts to Florida, Texas, California, British Columbia, and Alberta; also in Europe.

ILLUSTRATIONS: Bull. Torrey Club 47: pl. 11, f. 6–11; Krypt.-fl. Brand. 1: 74. f. 2; Rab. Krypt.-Fl. 6: f. 122. (European figures may be referable here in part only.)

EXSICCATAE: Aust. Hep. Bor.-Am. 143; Schiffn. Hep. Eur. Exs. 4.

22. *Riccia hirta* Aust.; Underw. Bot. Gaz. 19: 274. 1894.

Riccia arvensis hirta Aust. Proc. Acad. Phila. 1869: 232. 1870.

Thalli usually small, 3–9 mm. long, 1–4 times dichotomous, irregularly and often intricately gregarious, minutely, compactly, and rather obscurely reticulate above, becoming somewhat spongiose-furfuraceous on drying, glaucous-green above when living, commonly albescent when dry, the margins and sides often tinged with dark-purple; main segments oblong, 0.6–1.5 mm. wide; terminal segments oblong, subquadrate-ovate, or occasionally obovate, obtuse; margins subacute or, more often, obtuse and rounded, non-alate or weakly subalate, furnished with a few, mostly slender and sharp-pointed, rather rigid, nearly straight or slightly curved, minutely granulate cilia 50–150 μ long, these sometimes occurring also on the dorsal surface or now and then wholly wanting; median sulcus narrow and rather obtuse, abruptly defined in younger parts, becoming shallow and obsolescent in older parts; scales few and inconspicuous, sometimes projecting very slightly at extreme apex, often dark-purple; transverse sections subquadrate or parabolic, mostly 1–2 times as broad as high, 20–30 cells thick in median parts, the cells chlorophyllose almost or quite to the ventral epidermis, the ventral outline rounded; dorsal epidermis 1- or 2-stratose, the cells of the primary stratum rounded-obtuse or mammillate, soon collapsing and leaving irregular vestiges, or sometimes indurated and subpersistent, the cells of the succeeding stratum subglobose or ellipsoid, 24–40 μ broad, commonly broader than high. Monoicous; antheridial ostioles elevated 0–30 μ ; capsules usually numerous, often crowded, long included; spores yellowish-brown, becoming dark-brown with age, 90–135 μ in maximum diameter, angular, with a granular-papillate, crenulate, interrupted margin 3–12 μ broad, the outer face areolate, showing in profile obtuse or truncate papillae 2–4 μ long, the areolae mostly 10–13 μ wide, the inner faces less strongly or imperfectly areolate, scarcely papillate in profile.

TYPE LOCALITY: Closter, New Jersey.

DISTRIBUTION: Connecticut to Louisiana and Texas.

ILLUSTRATIONS: Bull. Torrey Club 47: pl. 12, f. 7–13.

EXSICCATAE: Aust. Hep. Bor.-Am. 142 (in part).

23. *Riccia californica* Aust. Bull. Torrey Club 6: 46. 1875.

Thalli medium-sized, forming rosettes 8–18 mm. in diameter, light-green, glaucescent, and reticulate above, concolorous below; main segments 1–3 times dichotomous, subquadrate or oblong-obcuneate, 1–2 mm. wide; terminal segments short-oblong or obovate, the apex obtuse, subtruncate or retuse; margins commonly obtuse, elevated and somewhat tumid when young, bearing toward the apex few or numerous, mostly slender and taper-pointed, rather rigid, occasionally uncinatate, minutely granulate cilia 150–400 μ long, these sometimes occurring sparingly also on the dorsal surface or now and then wholly deficient; median sulcus broad and obtuse except at apex, vanishing toward base; scales rudimentary and inconspicuous; transverse sections canaliculate-elliptic, becoming parabolic toward the base, 2–5 times as broad as high, 15–25 cells thick in median parts, the ventral outline more or less convex or nearly rectilinear; dorsal epidermis 2-stratose, the cells of the primary stratum hemispheric, ellipsoid, or papilliform, soon collapsing and leaving imperfect cups or irregular vestiges, the cells of the succeeding stratum 40–80 μ broad, commonly broader than high. Monoicous; antheridial ostioles very slightly or not at all elevated; capsules long included; spores brown, finally darkening, 65–90 μ in maximum diameter, angular, with a smooth, irregularly crenulate margin 3–12 μ wide, the outer face areolate, showing in profile obtuse or truncate papillae 2–4 μ long or less, the areolae mostly 6–10 μ wide, the inner faces similarly but less strongly marked.

TYPE LOCALITY: California.

DISTRIBUTION: California.

ILLUSTRATIONS: Mem. Torrey Club 7: pl. 89.

24. *Riccia trichocarpa* M. A. Howe, Bull. Torrey Club
25: 184. 1898.

Riccia ciliata Underw. Bull. Ill. Lab. Nat. Hist. 2: 26. 1884. Not *R. ciliata* Hoffm. 1795.

Riccia intumescens Underw. Bull. Ill. Lab. Nat. Hist. 2: 26, in part. 1884. Not *R. ciliata intumescens* Bisch. 1835.

Riccia tumida Underw. Syst. Bot. N. Am. 9: 7. 1895. Not *R. tumida* Lindenb. 1829.

Thalli medium-sized, 3–7 times dichotomous, in rosettes 15–20 mm. in diameter or irregularly radiating, light-green and regularly reticulate above, often blackening below and at margins; main segments linear, 0.75–1.5 (mostly 1) mm. wide; terminal segments obcuneate or oblong-elliptic, obtuse or subacute; margins rounded, tumid, often connivent on drying, the margins and sides densely clothed with white or tawny usually rigid, slender-pointed, rarely subuncinate, minutely granulate cilia 0.3–0.9 mm. long and with unequally thickened walls; median sulcus narrow and rather deep toward apex, obtuse or subacute, often nearly vanishing toward base; scales very inconspicuous; transverse sections subquadrate-oblong, 1.25–3 times as broad high (mostly 1.25–2 times in non-geminate parts), 20–28 cells thick in median parts, the ventral outline slightly convex toward apex, otherwise nearly rectilinear; dorsal epidermis 2-stratose, the cells of the primary stratum ovoid-papilliform or subhemispheric, soon collapsing and leaving irregular and finally inconspicuous vestiges, the cells of the succeeding stratum mostly 24–40 μ broad, often broader than high. Monoicous; antheridial ostioles elevated 50–100 μ ; capsules numerous, long included, the overlying epidermis commonly marked with a dark purple spot and nearly always bearing 1–12 cilia; spores soon black and very opaque, 90–125 μ in maximum diameter, angular, with a granulate-papillate, interrupted, often obsolete margin 1–5 μ wide, the outer face areolate, with age commonly showing in profile crowded truncate granulate papillae 2–5 μ long, the areolae (visible only in young spores) 6–12 μ broad, the inner faces similarly marked but scarcely papillate.

TYPE LOCALITY: Near Stanford University, California.

DISTRIBUTION: Texas and California.

ILLUSTRATIONS: Bull. Torrey Club 25: *pl.* 337; Mem. Torrey Club 7: *pl.* 88.

EXSICCATAE: Aust. Hep. Bor.-Am. 143*b*; Underw. & Cook, Hep. Am. 138 (as *R. arvensis hirta*)

25. *Riccia Donnellii* Aust. Bull. Torrey Club 6: 157. 1877.

Thalli large, commonly 10–12 mm. long, subsimple or 1–5 times dichotomous, at first subradiate, becoming irregularly gregarious, of a bright clear light-green and with a crystalline lustre when living, lighter-green and reticulate when dry, concolorous or occasionally brownish below, alate-carinate, the carina at times incrassate anteriorly and developing a descending pedunculate tuber; main segments linear to short-oblong, and obcordate, 2–7 mm. wide; terminal segments obovate, obcordate, or oblong, obtuse or emarginate; margins thin and alate, ascending in younger parts, elsewhere nearly plane, bearing a few or rather numerous short, stout, obtuse, sometimes geminate cilia 100–325 μ long and 75–150 μ in greatest width; median sulcus narrow, deep, and often abruptly closed in front, soon broadening and commonly disappearing in older parts; scales rudimentary or inconspicuous; transverse sections (without wing) semiorbicular or parabolic and (including wing) 1–4 times as broad as high; dorsal epidermis 2-stratose, the cells of the primary stratum subhemispheric or ovoid-ellipsoid, mostly 45–85 μ broad, obtuse or occasionally mammillate, soon collapsing and leaving irregular vestiges, the cells of the succeeding stratum mostly 75–150 μ broad, commonly broader than high. Dioicous, antheridial thallus often narrower; antheridial ostioles numerous, much elevated, 200–800 μ high; capsules usually numerous, 0.75–1 mm. in diameter, often crowded in a single or somewhat double row; spores soon black and very opaque, 130–190 μ in maximum diameter, angular, with a nearly smooth or lightly granulate margin 2–6 μ wide, the outer face areolate, in profile smooth or showing obscure truncate verrucae 2–4 μ high, the areolae (visible only in young stages) mostly 10–14 μ wide, the inner faces similarly but a little less strongly marked.

TYPE LOCALITY: Jacksonville, Florida.

DISTRIBUTION: Florida and Texas.

ILLUSTRATIONS: Bull. Torrey Club 47: *pl.* 10.

EXSICCATAE: Underw. & Cook, Hep. Am. 42.

This species is closely related to *R. Gougetiana* Mont. of the Mediterranean region of Europe and Africa, but living plants, cultivated side by side, indicate specific differences in general habit, in characters of the dorsal epidermis, etc.

2. RICCIOCARPUS Corda, in Opiz, Beitr. 651. 1829.

Gametophyte lemna-like and floating or finally attached to soil on the subsidence of water, or occasionally becoming more or less terricolous and marchantioid, 2–4 times dichotomous, the aquatic forms with few or no root-hairs and numerous long, pendent, linear or linear-lanceolate, reddish-violet or brownish-green, dentate scales, the terricolous forms with small or rudimentary scales and with both smooth and peg-walled root-hairs; median sulcus narrow and very pronounced. Basal or costal tissue much reduced, usually consisting of only a few layers of cells; assimilative layer composed of large irregularly polyhedral chambers separated by mostly unistratose lamellae and showing several series in a transverse section, the chambers visible through the epidermis as small hexagonal or subrhombic areolae. Primary epidermis persistent, compact and continuous except for a small stoma near the middle of each areola, the stoma bounded by 5 or 6 slightly modified cells, elevated and more highly developed in terricolous conditions. Monoicous (proterandrous and pseudo-dioicous). Antheridia in an elongate ridge-like androecium situated in the median furrow, with slightly elevated ostioles. Archegonia developed later than the antheridia in the same furrow or on a new lobe, without special involucre. Calyptra-wall bistratose or the inner of the two layers finally disintegrating.

Sporophyte-wall unistratose throughout, finally disintegrated, the mature spores surrounded by the calyptra. Spores separating at or before maturity. Accessory sterile cells wanting.

Type species, *Riccia natans* L.

1. *Ricciocarpus natans* (L.) Corda, in Opiz, Beitr. 651. 1829.

Riccia natans L. Syst. Nat. ed. 10. 1339. 1759.

Riccia capillata Schmidel, Ic. Pl. 276. 1797.

Riccia lutescens Schw. Specim. Fl. Am. Sept. 26. 1821.

Riccia velutina Wilson; Hook. Ic. Pl. *pl.* 249. 1840.

Ricciocarpus velutinus Stephani, Bull. Herb. Boiss. 6: 758. 1898.

Floating thalli or their segments obcordate or flabelliform, mostly 4–10 mm. long, and 4–9 mm. wide, dark-green, often violet or brownish on margins and lower surface; terricolous conditions forming rosettes 25–35 mm. in diameter or irregularly gregarious and having oblong, obovate, or obcuneate segments, these mostly 2–4 mm. wide; apices obtuse or subtruncate and emarginate, or cordate; margins acute, becoming more obtuse and bullate-undulate in terricolous forms; capsules slightly protuberant above, crowded in 1–3 series along the median line, of rather infrequent occurrence, being found chiefly in early summer in forms inhabiting transient ponds; spores dark-brown at maturity, 42–57 μ in maximum diameter, angular, rather narrowly and obscurely dentate-alate, almost uniformly papillate-areolate on all faces, the areolae poorly defined, mostly 7–8 μ broad, obscure with age, the papillae numerous, obtuse or truncate, 1–4 μ long.

TYPE LOCALITY: Hadley, Suffolk, England.

DISTRIBUTION: Cosmopolitan. Ontario to British Columbia; San Luis Potosí; Cuba.

ILLUSTRATIONS: Schmidel, Ic. Pl. *pl.* 74; Nova Acta Acad. Leop.-Carol. 17: *pl.* 71, *f.* V; 18: *pl.* 26, 31, 32; Mem. Am. Acad. II. 4: *pl.* 4, *f.* A; Leitgeb. Unters. Leberm. 4: *pl.* 2, *f.* 13–23; Krypt.-fl. Brand. 1: 84. *f.* a–d; Pearson, Hep. Brit. Isles *pl.* 225; Bot. Gaz. 37: *pl.* 9, 10, *f.* 1–4; 41: *pl.* 5–9; Rab. Krypt.-Fl. 6: *f.* 7, 139.

EXSICCATAE: Drummond, So. Mosses 156, 157; Sull. Musci Allegh. 292; Aust. Hep. Bor.-Am. 144, 145 (as *R. natans terrestris*), 146; Underw. & Cook, Hep. Am. 1, 21; Haynes, Am. Hep. 21.

3. OXYMITRA Bisch.; Lindenb. Syn. Hep. Eur. 124. 1829.

Tessellina Dumort. Comm. Bot. 78, in part. 1822; Hep. Eur. 165. 1874.

Rupinia Corda, in Opiz, Beitr. 650. 1829. Not *Rupinia* L. f. Suppl. 69. 1781.

Pycnoscenus Lindb. Oefv. Sv. Vet.-Akad. Förh. 19: 606. 1863.

Gametophyte terricolous. Assimilative layer consisting of large, subvertical, 4–7-angled, prismatic or obpyramidal air-chambers, bounded by unistratose lamellae and each opening

above by a well-developed simple stelliform stoma. Primary epidermis persistent. Latero-ventral scales usually large and conspicuous. Dioicous or synoicous. Antheridia in the dioicous species immersed in a well-defined sessile median receptacle, and provided with elevated cylindric or conic-cylindric ostioles, the receptacle bordered and often more or less covered with articulate hairs or cilia; antheridia of the synoicous species in individual, essentially free, flask-shaped involucre. Archegonia occurring along the median sulcus in free conic-pyramidal or trigonous-pyramidal individual involucre, these provided with air-chambers and stomata and becoming large after fertilization. Calyptra mostly unistratose at maturity.

Sporophyte-wall unistratose, sometimes 2-stratose at apex, and often 2- or 3-stratose at base, the latter thickening doubtless representing a rudimentary foot, the mature sporophyte surrounded and covered by the calyptra and by the conspicuously exerted long-persistent conic-pyramidal or trigonous-pyramidal pointed or subrostrate involucre, the capsule-wall rather persistent. Spores separating at or before maturity, the young accompanied by traces of accessory sterile cells.

Type species, *Oxymitra paleacea* Bisch.

1. *Oxymitra androgyna* M. A. Howe, Bryologist 17: 93. 1914.

Thalli mostly 8-18 mm. long, 1-3 times dichotomous, loosely gregarious or closely aggregated in more or less rosette-like masses, finely areolate and glaucous-green above, pale-green or brownish-purple below; main segments oblong, quadrate-oblong, or subovate, 4-7 mm. broad, 2-3 mm. thick, one-third to one-half of this thickness occupied by the assimilative layer; terminal segments quadrate-obovate or obcordate, obtuse or emarginate; margins subacute, ascending, spreading, or slightly recurved, often connivent on drying; median sulcus deep, acute, narrow, and sharply defined; latero-ventral scales numerous and conspicuous, projecting far beyond the margins, 2-4 mm. long, lanceolate or ovate, with long-acuminate or filiform-acuminate apices hyaline throughout or reddish-brown at base; transverse sections subquadrate, 1-2 (mostly 1.5) times as broad as high, rarely higher than broad; cells of epidermis 26-50 μ broad, mostly broader than high; rays of the stomatal stars strongly thickened, ovoid, dome-shaped, or lanceolate-acuminate in surface view. Synoicous, with an occasional tendency to dioicism; antheridia intermingled with the archegonia and with articulate hairs and filiform scales at the bottom of the median sulcus or often somewhat laterally disposed in relation to the archegonia, the elevated antheridial ostioles cylindric or conic-cylindric, mostly 0.5-0.7 mm. high and 85-110 μ broad, decolorate or light-brown; sporogonial involucre rostrate, obscurely trigonous-pyramidal, conic-cylindric, or cupulate-ovoid, 1.1-2.0 mm. high, 0.8-1.0 mm. broad, lightly 8-12-ribbed; spores finally very dark and opaque, 125-175 μ in maximum diameter, angular, the outer face bearing areolae 24-35 μ broad, exhibiting in profile a few verrucae 2-5 μ high, the inner faces smooth.

TYPE LOCALITY: Near Austin, Texas.

DISTRIBUTION: Texas.

ILLUSTRATION: Bryologist 17: 72. f. 1.

Family 2. CORSINIACEAE

BY ALEXANDER WILLIAM EVANS

Plants scattered or in depressed mats, perennial. Thallus medium-sized (about 2 cm. long), sparingly dichotomous, the upper surface more or less clearly divided into polygonal areas by the boundaries of the air-chambers. Epidermis with simple pores; air-chambers in a single layer, with or without unbranched green filaments; ventral tissue well-developed, composed of uniform, thin-walled parenchyma; ventral scales in two longitudinal rows or irregularly scattered in more than two rows, with rudimentary appendages. Autoicous or dioicous. Antheridia in an elongate, sessile dorsal receptacle or irregularly scattered over the surface. Archegonia forming a dorsal cluster on an ordinary branch; involucre, when present, an irregular outgrowth with air-chambers and simple pores, sometimes peltately attached. Sporophyte consisting of a capsule, seta, and foot. Capsule spheric, the wall composed of a single layer of cells, with or without annular thickenings; dehiscence irregular; seta very short; foot bulbous; sterile cells short, not developed as elaters but sometimes with annular or spiral thickenings. Gemmae lacking.

1. CORSINIA Raddi, Opusc. Sci. Bologna 2: 354. 1818.

Guentheria Trev. Jahrb. Gewächsk. 1³: 10. 1820.

Tessellina Dumort. Comm. Bot. 78. 1822.

Brissocarpus Bisch.; Lindb. Nova Acta Acad. Leop.-Carol. 14: Suppl. 123. 1829.

Thallus of a rather firm texture, yellowish to bright-green, not pigmented with purple, sparingly dichotomous, rarely with apical innovations. Epidermis composed of a single layer of thin-walled cells without trigones; pores surrounded by one or two concentric series of thin-walled cells; air-chambers large, mostly in a single layer; green filaments often absent, when present short, extending only a short distance toward the epidermis; ventral scales irregularly scattered, colorless, ovate to lunulate, gradually narrowed into a filamentous appendage, entire. Usually dioicous, rarely autoicous. Antheridia in an elongate and sometimes forked receptacle, bordered on each side by a low ridge. Involucre often absent, when present in the form of a lobed outgrowth, attached laterally or peltately to the thallus; calyptra fleshy and coarsely tuberculate. Wall of capsule without thickenings. Spores indistinctly tetrahedral; sterile cells without thickenings.

Type species, *Corsinia marchantioides* Raddi.

1. *Corsinia coriandrina* (Spreng.) Lindb. Hep. Utveckl. 30. 1877.

Riccia reticulata J. F. Gmel. Syst. Nat. 2: 1355. 1791. Not *R. reticulata* Sw. 1788.

Riccia coriandrina Spreng. Anl. 3: 320. 1804.

Corsinia marchantioides Raddi, Opusc. Sci. Bologna 2: 354. 1818.

Guentheria graveolens Trev. Jahrb. Gewächsk. 1³: 10. 1820.

Tessellina coriandrina Dumort. Comm. Bot. 78. 1822.

Brissocarpus riccioides Bisch.; Lindb. Nova Acta Acad. Leop.-Carol. 14: Suppl. 123. 1829.

Corsinia marchantioides gymnocarpa Bisch. Nova Acta Acad. Leop.-Carol. 17: 1045. 1835.

Corsinia marchantioides involucrata Bisch. Nova Acta Acad. Leop.-Carol. 17: 1046. 1835.

Corsinia reticulata Dumort. Hep. Eur. 166. 1874.

Thallus mostly 2–4 cm. long and 5–6 mm. wide, plane above but with a narrow median groove and wavy margins, below with a broad rounded keel; epidermal cells averaging about $50 \times 30 \mu$; pores slightly elevated, the bounding cells often breaking down with age and leaving irregular openings into the air-chambers; partitions separating the air-spaces one cell thick, the cells in the vicinity of the epidermis with more or less thickened walls and often with

trigones. Spores deep blackish-brown, becoming almost opaque with age, mostly 100–130 μ in diameter, with a wing 16–20 μ wide, the spheric face covered over with a coarse network having meshes 25–35 μ in diameter, the boundaries of the meshes being marked by grooves, the plane faces smooth; sterile cells colorless or pale-brown.

TYPE LOCALITY: Italy.

DISTRIBUTION: Texas; possibly Louisiana; also in Europe, the Atlantic Islands, Africa (Algeria), Asia (Japan) and South America.

ILLUSTRATIONS: Micheli, Nov. Pl. Gen. *pl.* 57, *f.* 1; Dill. Hist. Musc. *pl.* 78, *f.* 15; Rab. Krypt.-Fl. 6: *f.* 142, 143; Atti Ist. Veneto 75: *pl.* 27.

Family 3. TARGIONIACEAE

BY ALEXANDER WILLIAM EVANS

Plants scattered or in depressed mats, perennial. Thallus small to medium-sized (mostly 0.5–2 cm. in length), dichotomous and also with ventral branches, the upper surface more or less clearly divided into polygonal areas by the boundaries of the air-chambers. Epidermis with simple pores; air-chambers in a single layer, with or without green filaments; ventral tissue sometimes well developed, sometimes greatly reduced, destitute of sclerotic cells but sometimes with slime-cells and cells containing oil-bodies; ventral scales in two longitudinal rows, appendiculate or greatly reduced and destitute of appendages. Autoicous or dioicous. Antheridia forming small dorsal clusters, usually on short branches with limited growth; associated epidermal pores, if present, simple. Archegonia forming a terminal cluster on an ordinary branch, developing from dorsal segments but usually appearing ventral in position through the vigorous intercalary growth of the thallus behind them; involucre membranous (at least in part), bilabiate or undivided; pseudoperianths lacking. Sporophyte consisting of a capsule, a seta, and a foot. Capsule spheric or ellipsoid, containing both spores and elaters, the wall one cell thick except in the apical region, the cells (at least in part) with annular thickenings; dehiscence by means of splits extending backward from the apex, the thickened apical portion coming off in one piece or in fragments; seta short; foot bulbous or branched; sterile cells developed as elaters. Gemmae lacking.

Thallus thick and leathery, distinctly differentiated into epidermis, chlorophyll-bearing tissue (with green filaments in the air-chambers), and compact ventral tissue.

Thallus thin and fragile, consisting largely of two layers of green cells separated by a single layer of large air-chambers without filaments, the ventral tissue being greatly reduced.

1. TARGIONIA.

2. CYATHODIUM.

1. TARGIONIA (Micheli) L. Sp. Pl. 1136. 1753.

Thallus firm and leathery, dark-green, more or less pigmented with purple, at first sparingly dichotomous but afterwards with ventral branches. Epidermis composed of a single layer of pale or colorless cells with distinct trigones; pores surrounded by several radiating series of cells with thin walls; air-chambers with closely crowded, simple or branched, green filaments; ventral scales large, purple, appendiculate. Autoicous or dioicous. Antheridia forming a small group with or without marginal paleae, situated near the tip of an ordinary branch or, more usually, of a short ventral branch. Archegonia and sporophytes appearing ventral in position; involucre bilabiate, the edges of the lips at first in close contact. Cells of capsule-wall all with complete or incomplete annular thickenings; foot bulbous. Spores reticulate.

Type species, *Targionia hypophylla* L.

1. *Targionia hypophylla* L. Sp. Pl. 1136. 1753.

Targionia Michelii Corda, in Opiz. Beitr. 649. 1829.

Targionia germanica Corda, in Opiz. Beitr. 649. 1829.

Targionia mexicana Lehm. & Lindenb.; Lehm Stirp. Pug. 4: 27. 1832.

Targionia capensis Hüben. Hep. Germ. 17. 1834.

Targionia bifurca Nees & Mont.; Mont. Ann. Sci. Nat. II. 9: 113. 1838.

Targionia convoluta Lindenb. & Gottsche; G. L. N. Syn. Hep. 576. 1846.

Thallus usually with a narrow purple margin above and deep-purple below, plane or nearly so when moist but often with the margins more or less incurved when dry, mostly 1–2 cm. long and 2–5 mm. wide; ventral branches including apical innovations usually abundant; epidermal cells averaging about $30 \times 15 \mu$, the trigones often with convex sides; pores somewhat elevated, appearing as more or less conspicuous white dots, with a broad membrane around the opening, surrounded by about 6 radiating series of cells with 2 cells in each series; filaments in the air-chambers composed of spheroidal cells, the terminal cells in the vicinity of the pores larger than the others and usually colorless except at their bases; ventral tissue composed of cells with more or less pitted walls, scattered cells containing oil-bodies present and sometimes slime-cells; ventral scales large but scarcely reaching the margin of the thallus; appendage lanceolate, mostly 0.25–0.45 mm. long and 0.1–0.2 mm. wide, the margin entire to sparingly and irregularly spinose-dentate. Autoicous; antheridia borne in a small cluster at the tip of a short ventral branch; involucre several cells thick throughout and developing air-spaces without filaments in the basal part, becoming deep blackish-purple with age and often iridescent, the margins entire or minutely toothed; spores brown, mostly 60–80 μ in diameter, indistinctly tetrahedral, covered over with a very fine and irregular reticulum, the meshes mostly 2–3 μ wide, and in addition with a coarse and regular, although often incomplete reticulum, the meshes 16–20 μ wide; elaters mostly 8–12 μ wide, usually with two dark spiral bands throughout the entire length.

TYPE LOCALITY: Europe (Italy, Spain and Turkey).

DISTRIBUTION: British Columbia south to California and Arizona; Mexico; Salvador; also in South America, Europe, Africa, Asia, and various islands of the Pacific; growing on shaded and usually rocky banks.

ILLUSTRATIONS: Micheli, Nov. pl. Gen. pl. 3; Dill. Hist. Musc. pl. 78, f. 9; Ann. Sci. Nat. II. 9: pl. 3; Pearson, Hep. Brit. Isles Pl. pl. 214; Rab. Krypt.-Fl. 6: f. 144–146; Atti Ist. Veneto 75: pl. 25.

EXSICCATAE: Aust. Hep. Bor.-Am. 137; Underw. & Cook, Hep. Am. 159; Haynes, Am. Hep. 27.

2. *CYATHODIUM* Kunze; Lehm. Stirp. Pug. 6: 17. 1834.

Synhymenium Griff. Not. Pl. Asiat. 2: 344. 1849.

Thallus thin and delicate, pale-green to dark-green, sometimes tinged with yellowish or brownish and often appearing phosphorescent, regularly dichotomous but also with ventral branches. Epidermis green, composed of a single layer of thin-walled cells; pores large, surrounded by several radiating series of cells; air-chambers large, without green filaments, sometimes with incomplete supplementary partitions; ventral tissue greatly reduced and sometimes lacking in the vegetative portion of the thallus, the ventral surface being bounded by a single layer of green cells; ventral scales in two rows, very small and not clearly appendiculate; tuberculate rhizoids sometimes lacking. Autoicous. Antheridia forming a small group without marginal paleae on a very short ventral branch. Archegonia sometimes appearing ventral in position but sometimes not displaced and clearly retaining their dorsal position; involucre more or less deeply lobed or undivided, membranous throughout, entire. Cells of capsule-wall with annular thickenings in the upper third; seta slender; foot rudimentary or more or less branched; spores more or less tuberculate.

Type species, *Cyathodium cavernarum* Kunze.

1. *Cyathodium cavernarum* Kunze; Lehm. Stirp. Pug. 6: 18. 1834.

? *Cyathodium mexicanum* Stephani, Rev. Bryol. 36: 139. 1909.

Thallus bright-green, more or less phosphorescent in appearance, plane, mostly 0.5–1 cm. long and 2–3 mm. wide, the individual branches mostly 1–1.5 mm. wide; epidermal cells averaging about $50 \times 30 \mu$, smaller cells containing oil-bodies scattered among the others;

pores relatively large, usually surrounded by 6–8 radiating series of narrow and almost colorless cells, 2 or 3 cells in each series; ventral tissue present in small amount in the region of the archegonia, the ventral surface elsewhere being bounded by a single layer of cells connected with the epidermis by the green partitions, one cell thick, between the air-chambers; ventral scales filamentous, usually 3 cells long, averaging about 0.16×0.03 mm.; tuberculate rhizoids lacking. Autoicous; male branches consisting of small cushion-like outgrowths close to the margins of the thallus; archegonia plainly visible from above; involucre undivided or with a shallow indentation, the margin bounded by one or two rows of cells with thicker walls pigmented with brown; spores brownish-black, usually $55\text{--}70\ \mu$ in diameter, spheric, the whole surface covered over with pointed processes $3\text{--}4\ \mu$ long, giving the spore-profile an echinulate appearance; elaters mostly $12\text{--}14\ \mu$ wide, often 0.5 mm. long, with two or three dark-brown spirals.

TYPE LOCALITY: Caobas, Cuba.

DISTRIBUTION: Cuba; perhaps Mexico.

ILLUSTRATIONS: Sagra, Hist. Cuba 9: *pl.* 19, *f.* 4.

Family 4. SAUTERIACEAE

BY ALEXANDER WILLIAM EVANS

Plants scattered or in depressed mats, perennial. Thallus small to medium-sized (mostly 0.5–2 cm. in length), branching dichotomously and also ventrally, the upper surface divided into more or less distinct polygonal areas by the boundaries of the air-chambers. Epidermis distinct, with simple, usually stellate, pores; scattered cells with oil-bodies present; air-chambers in one or more layers, destitute of green filaments and supplementary partitions, the primary partitions green and one cell thick; ventral tissue destitute of sclerotic cells; ventral scales in two or more longitudinal rows, appendiculate or gradually narrowed from a broad base into a more or less elongate sharp apex. Paroicous, autoicous, or dioicous. Antheridia borne on a more or less definite sessile receptacle, dorsal in position, or in irregular dorsal median groups; associated epidermal pores simple. Archegonia at first superficial, usually borne singly on the lobes of terminal or dorsal stalked receptacles representing specialized branches, soon appearing ventral in position through the active intercalary growth of the receptacles; stalk without green tissue; disc deeply lobed, the central part without air-spaces, the lobes with air-spaces and simple epidermal pores; involucre bilabiate; pseudoperianths lacking. Sporophyte consisting of a capsule, a seta, and a foot. Capsule subspheric, the wall one cell thick except in the apical region, containing both spores and elaters, the cells with complete or incomplete annular thickenings; dehiscence by means of several splits extending backwards from the apex; spores covered with coarse papillae. Gemmae lacking.

Antheridia borne in a more or less elongate and vaguely defined median group without paleae.

Female receptacle becoming dorsal, the stalk without a rhizoid-furrow, the paleae with few or no slime-papillae.

Female receptacle terminal, the stalk with one rhizoid-furrow, the paleae with numerous slime-papillae.

Antheridia borne on a definite sessile receptacle with marginal paleae; female receptacle terminal, the stalk with two rhizoid-furrows.

1. CLEVEA.

2. SAUTERIA.

3. PELTOLEPIS.

1. CLEVEA Lindb. Not. Sällsk. Faun. Fl. Fenn. 9: 289. 1868.

Thallus dull-green or glaucous-green throughout or somewhat pigmented with purple, regularly dichotomous but sometimes with ventral branches. Epidermis composed of a single layer of cells thin-walled or with indistinct trigones; pores with or without thickenings in the radial walls of the surrounding cells; green tissue loose; ventral scales in more than two, irregular, longitudinal rows, colorless or purple, gradually narrowed into an acuminate point but not truly appendiculate, the margin with few or no slime-papillae. Dioicous or monoicous. Antheridia forming an irregular, elongate, median group without paleae. Female receptacle becoming dorsal, the stalk without a rhizoid-furrow, the paleae numerous, white or purple, with few slime-papillae; disc of receptacle slightly convex, very deeply divided into 2–4 lobes, extending obliquely outward. Cells of capsule-wall with complete brown annular thickenings.

Type species, *Marchantia hyalina* Sommerf.

1. *Clevea hyalina* (Sommerf.) Lindb. Not. Sällsk.

Faun. Fl. Fenn. 9: 291. 1868.

- Marchantia cruciata* Sommerf. Suppl. Fl. Lapp. 79. 1826. Not *M. cruciata* L. 1753.
Marchantia hyalina Sommerf. Mag. Naturvid. II. 1: 284. 1833.
Sauteria alpina Angstr. Bot. Notiser 1839: 97, in part. 1839. Not *S. alpina* Nees, 1838.
Grimaldia punicea Wallr. Linnaea 14: 687. 1840.
Sauteria seriata Lindb. Hedwigia 5: 33. 1866.
Sauteria (Clevea) hyalina Lindb. Oefv. Sv. Vet.-Akad. Förh. 3: 561. 1866.
Sauteria suecica Lindb. in Gottsche & Rab. Hep. Eur. 347. 1866.
Plagiochasma erythrospermum Sull.; Aust. Proc. Acad. Phila. 1869: 229. 1870.
Sauteria limbata Aust. Proc. Acad. Phila. 1869: 229, in part. 1870.
Clevea hyalina suecica Lindb. Bot. Notiser 1877: 78. 1877.
Clevea suecica Lindb. Musci Scand. 1. 1879.
Aytonia erythrosperma Underw. Bull. Ill. Lab. Nat. Hist. 2: 43. 1884.
Clevea hyalina californica M. A. Howe, Mem. Torrey Club 7: 38. 1899.

Thallus usually dull-green or glaucous-green throughout or with a slight purplish pigmentation along the margin and beneath, mostly 0.5–1.5 cm. long and 2–6 mm. wide, the upper surface clearly divided into polygonal areas; branching dichotomous, ventral branches lacking; epidermal cells averaging about $50 \times 30 \mu$, thin-walled or with scarcely evident trigones; pores usually stellate but sometimes with thin radial walls, surrounded by 6 or 7 cells; green tissue loose; ventral scales sometimes more or less purple but usually white throughout, projecting considerably beyond the margin and forming a more or less conspicuous apical cluster. Dioicous; antheridia forming an irregular, elongate, median group without paleae; female receptacles borne singly or in a short median row, the stalk mostly 0.5–1.5 cm. long, the disc mostly 2.5–4 mm. wide, the paleae usually white but sometimes purple; spores reddish-brown, mostly $45\text{--}55 \mu$ in diameter; elaters mostly 8–12 μ wide, with 2–4 spirals in the middle and usually with 2 at each end.

TYPE LOCALITY: Norway.

DISTRIBUTION: Greenland and Ellesmere Land; Vermont; Montana to British Columbia and south to Colorado and California; also in Europe; an arctic and alpine species, preferring calcareous rocks.

ILLUSTRATIONS: Rab. Krypt.-Fl. 6: f. 20, 147, 148; Atti Ist. Veneto 75: pl. 23.

EXSICCATAE: Underw. & Cook, Hep. Am. 166; Macoun, Can. Hep. 75.

2. SAUTERIA Nees, Naturg. Eur. Leberm. 4: 139. 1838.

Hampea Nees, Naturg. Eur. Leberm. 4: 139, as synonym. 1838. Not *Hampea* Schlecht. 1837.

Thallus dull-green or glaucous-green, not pigmented with purple, sparingly dichotomous but with numerous ventral branches. Epidermis colorless, composed of a single layer of thin-walled cells, usually with more or less distinct trigones; pores distinctly stellate; green tissue loose; ventral scales in more than two, irregular, longitudinal rows, colorless, gradually narrowed into an acuminate point but not truly appendiculate, the margin with numerous slime-papillae. Autoicous, more rarely paroicous. Antheridia forming an irregular, elongate median group without paleae. Female receptacle terminal on a very short branch of a dichotomy and thus appearing lateral, the stalk with a single rhizoid-furrow, the paleae fairly numerous, white, with numerous slime-papillae; disc of receptacle slightly convex, deeply divided into 3–5 (mostly 4) lobes, extending obliquely outward. Cells of capsule-wall with brown, incomplete annular thickenings.

Type species, *Lunularia alpina* Nees.

1. *Sauteria alpina* Nees, Naturg. Eur. Leberm. 4: 143. 1838.

Lunularia alpina Nees; Nees & Bisch. Flora 13: 399. 1830.

Thallus mostly 0.5–1.5 cm. long and 3–5 mm. wide, the upper surface clearly divided into polygonal areas, the roofs of the chambers often disappearing with age, with a rounded keel and thin, erect-spreading wings; epidermal cells averaging about $50 \times 30 \mu$; pores distinctly elevated, usually surrounded by 6 cells, the thickenings of the radial walls distinct; ventral scales scarcely extending to the margin and not forming a conspicuous apical cluster. Antheridia usually borne on a ventral branch, more rarely on a branch of a dichotomy; stalk of female receptacle mostly 1–1.5 cm. long, the disc about 2 mm. wide; spores yellowish-brown, mostly $60\text{--}70 \mu$ in diameter; elaters about 10 μ wide, with 2–4 brown spirals.

TYPE LOCALITY: Austria.

DISTRIBUTION: Greenland; Quebec; Alaska; Alberta; also in Europe and northern Asia; a species of arctic and alpine regions, growing on calcareous substrata.

ILLUSTRATIONS: Nova Acta Acad. Leop.-Carol. 17: *pl.* 67, *f.* 22–28; Rab. Krypt.-Fl. 6: *f.* 150, 151; Atti. Ist. Veneto 75: *pl.* 22.

3. PELTOLEPIS Lindb. Bot. Notiser 1877: 73. 1877.

Thallus bright-green, more or less pigmented with purple, the branching regularly dichotomous. Epidermis mostly colorless, composed of a single layer of cells with more or less distinct trigones; pores more or less stellate; green tissue loose; ventral scales in two longitudinal rows, more or less pigmented, small and inconspicuous, with one or two appendages. Paroicous and autoicous. Male receptacles dorsal, not limiting the growth of the branch, sometimes occurring in a short median series, circular in outline, slightly elevated, and with marginal paleae. Female receptacle terminal on a more or less elongate branch, the stalk with two rhizoid-furrows, the paleae numerous, purple, with numerous slime-papillae; disc of receptacle more or less convex, deeply divided into 3–8 (rarely 9 or 10) lobes, extending obliquely outward. Cells of capsule-wall with pale, complete annular thickenings.

Type species, *Sauteria grandis* Lindb.

1. *Peltolepis grandis* Lindb. Bot. Notiser 1877: 74. 1877.

Sauteria alpina Angstr. Bot. Not. 1839: 97, in part. 1839. Not *S. alpina* Nees, 1838.

Sauteria grandis Lindb. Medd. Soc. Faun. Fl. Fenn. 1: 113. 1876.

Peltolepis sibirica Lindb. Acta Soc. Faun. Fl. Fenn. 2³: 4. 1882.

Peltolepis grandis sibirica Lindb. Medd. Soc. Faun. Fl. Fenn. 9: 162. 1883.

Peltolepis grandis angustifrons Lindb.; Lindb. & Arnell, Sv. Vet.-Akad. Handl. 23⁵: 13. 1889.

Thallus mostly 1–2 cm. long and 5–7 mm. wide, sometimes appreciably narrower, the purple pigmentation involving the lower surface and sometimes the whole upper surface but usually here restricted to the margin, strongly convex below, channeled above and with erect-spreading wings; epidermal cells with more or less thickened walls and often with distinct trigones; pores slightly elevated, usually surrounded by 5 or 6 cells, the thickenings of the radial walls ovate-lanceolate in outline when well developed but sometimes scarcely apparent; appendages of the ventral scales lanceolate, white or purplish. Normally paroicous but often with male branches; stalk of female receptacle mostly 0.5–1 cm. long, the paleae abundant toward the apex, lanceolate and bearing numerous slime-papillae, the disc about 3 mm. wide; spores dark-brown, mostly 45–50 μ in diameter; elaters 8–10 μ wide, with 2 or 3 yellow spirals.

TYPE LOCALITY: Scandinavia.

DISTRIBUTION: Greenland; also in Europe and northern Asia; a species of arctic and alpine regions, preferring calcareous substrata.

ILLUSTRATIONS: Gottsche & Rab. Hep. Eur. 347, *f.* 1–6; Rab. Krypt.-Fl. 6: *f.* 152, 153; Atti Ist. Veneto 75: *pl.* 21.

Family 5. REBOULIACEAE

BY ALEXANDER WILLIAM EVANS

Plants scattered or in depressed mats, perennial. Thallus small to medium-sized (mostly 0.5–2 cm. in length), at first dichotomous but often later with ventral branches, the upper surface sometimes divided into distinct polygonal areas by the boundaries of the air-chambers but more frequently appearing homogeneous. Epidermis distinct with simple, rarely stellate, pores; air-chambers apparently in several layers (at least in the median part of the thallus), destitute of true green filaments but often subdivided by supplementary partitions, these and the primary partitions green and one cell thick; ventral tissue destitute of sclerotic cells; ventral scales appendiculate, in two longitudinal rows. Dioicous or monoicous. Antheridia borne on more or less definite sessile receptacles, terminal or dorsal in position, or in irregular dorsal median groups; epidermal pores associated with them compound or simple. Archegonia at first superficial, borne singly or more rarely in groups on the lobes of terminal or dorsal stalked receptacles representing specialized branches, soon appearing ventral in position through the active intercalary growth of the receptacles; stalk without green tissue; epidermal pores compound; involucre membranous (at least in part), undivided or bilabiate; pseudoperianths present in *Asterella*, lacking elsewhere. Sporophyte consisting of a capsule, a seta, and a foot. Capsule spheric to short ellipsoid, containing both spores and elaters, the wall one cell thick except in the apical region, the cells without annular thickenings but sometimes with trigones; dehiscence by means of a more or less clearly defined operculum; seta very short; foot bulbous. Gemmae lacking.

Pseudoperianth lacking.

Female receptacle becoming dorsal, the stalk without a rhizoid-furrow; operculum falling away in fragments.

Female receptacle terminal, the stalk with a single rhizoid-furrow.

Female receptacle shortly or not at all lobed; operculum remaining intact.

Involucre undivided.

Involucre bilabiate.

Female receptacle distinctly lobed; involucre bilabiate; operculum falling away in fragments.

Pseudoperianth present, consisting of a white to purple inflated tube contracted at the mouth, soon becoming longitudinally split into narrow segments usually remaining attached at their tips.

1. *PLAGIOCHASMA*.

2. *GRIMALDIA*.

3. *CRYPTOMITRIUM*.

4. *REBOULIA*.

5. *ASTERELLA*.

1. *PLAGIOCHASMA* Lehm. & Lindenb.; Lehm. Stirp. Pug. 4: 13. 1832.

*Aytonia** Forst. Char. Gen. Pl. 147. 1776. Not *Aitonia* Thunb. 1776.

? *Rupinia* L. f. Suppl. 69. 1781.

Anthrocephalus Lehm. Nova Acta Acad. Leop.-Carol. 18: 682. 1836.

Otionea Dumort. Hep. Eur. 148. 1874. Not *Otionea* Corda, 1829.

Thallus dichotomous and also with ventral branches, sometimes with apical innovations, more or less pigmented with purple, its texture firm, the upper surface not divided into distinct polygons; epidermis colorless or pale, sometimes covered over with a waxy deposit, composed of a single layer of thin-walled cells with more or less distinct trigones, destitute

* Often spelled *Aitonia*.

of cells containing oil-bodies; pores sometimes minute and surrounded by a circle of 4–6 cells with more or less thickened radial walls, sometimes larger and surrounded by six to ten radiating series of cells with two or more cells in each series, the radial walls thin or more or less thickened; green tissue compact to loose, the dorsal air-chambers more or less subdivided by supplementary partitions; ventral tissue composed of thin-walled cells, some containing oil-bodies. Paroicous, autoicous, or dioicous; antheridia arising in acropetal succession on well-defined receptacles with simple pores and a fringe of marginal paleae, soon becoming dorsal in position, the male branch continuing its growth directly; female receptacle soon becoming dorsal in position, the stalk without rhizoid-furrows, but with scattered slender paleae, the disc convex to concave, with more or less distinct, often apiculate lobes, the archegonia usually borne singly; involucre bilabiate, entire; pseudoperianth lacking; capsule with an indistinct operculum, falling away in fragments at dehiscence; spores tetrahedral, with wings along the edges and usually with networks on the faces, formed by anastomosing ridges; elaters usually with spirals, rarely with uniformly thickened walls.

Type species, *Plagiochasma cordatum* Lehm. & Lindenb.

Epidermal pores inconspicuous, not elevated, usually surrounded by a circle of four to six cells, not in radiating series.

Epidermal pores conspicuous, elevated, usually surrounded by six or more radiating series of cells.

Elaters with spirals.

Appendages of ventral scales ovate to orbicular, abruptly acute or apiculate.

Appendages about as long as the scales.

Appendages much shorter than the scales.

Appendages of ventral scales lanceolate or subulate to ovate, obtuse to acuminate but not apiculate.

Appendages constricted at the base.

Appendages not constricted at the base.

Elaters with uniformly thickened walls.

1. *P. rupestre*.

2. *P. crenulatum*.

3. *P. jamaicense*.

4. *P. Wrightii*.

5. *P. Landii*.

6. *P. intermedium*.

1. *Plagiochasma rupestre* (Forst.) Stephani,

Bull. Herb. Boissier 6: 783. 1898.

Aytonia rupestris Forst. Char. Gen. Pl. 148. 1776.

? *Rupinia lichenoides* L. f. Suppl. 69. 1781.

Rupinia rupestris Sw. Meth. Musc. 39. 1781.

Reboulia maderensis Raddi, Giorn. Sci. Lett. Arti —. My 1821.—Mem. Soc. Ital. Modena 20: 3. 1829.

Sedgwickia hemisphaerica Bisch. Nova Acta Acad. Leop.-Carol. 17: 1079. 1835. Not *S. hemisphaerica* Bowdich, 1825.

Plagiochasma Aitonia Lindenb. & Nees; Nees, Naturg. Eur. Leberm. 4: 41. 1838.

Antrocephalus italicus Sassi, Atti Riun. Sci. Ital. 1: 160. 1840.

Jungermannia (Fegatella) australis Tayl.; Hook. f. & Tayl. Lond. Jour. Bot. 3: 572. 1844.

Jungermannia (Fegatella) limbata Tayl.; Hook. f. & Tayl. Lond. Jour. Bot. 4: 95. 1845.

Plagiochasma australe Nees; G. L. N. Syn. Hep. 515. 1846.

Plagiochasma limbatum Nees; G. L. N. Syn. Hep. 516. 1846.

Plagiochasma elongatum Lindenb. & Gottsche; G. L. N. Syn. Hep. 519. 1846.

Plagiochasma mexicanum Lindenb. & Gottsche; G. L. N. Syn. Hep. 519. 1846.

Plagiochasma italicum De-Not. Mem. Accad. Torino II. 18: 476. 1859.

Aytonia italica Lindb. Not. Sällsk. Faun. Fl. Fenn. 9: 291. 1868.

Ottonia rupestris Dumort. Hep. Eur. 148. 1874.

Ottonia italica Dumort. Hep. Eur. 149. 1874.

Rupinia italica Trevisan, Rend. Ist. Lomb. II. 7: 785. 1874.

Rupinia mexicana Trevisan, Mem. Ist. Lomb. 13: 437. 1877.

Rupinia elongata Trevisan, Mem. Ist. Lomb. 13: 437. 1877.

Rupinia limbata Trevisan, Mem. Ist. Lomb. 13: 437. 1877.

Rupinia australis Trevisan, Mem. Ist. Lomb. 13: 437. 1877.

Aytonia lanigera Spruce, Trans. Bot. Soc. Edinb. 15: 568. 1885.

Aytonia australis Stephani, Hedwigia 28: 129. 1889.

Aytonia elongata Underw. Bot. Gaz. 20: 66. 1895.

Aytonia mexicana Underw. Bot. Gaz. 20: 66. 1895.

Plagiochasma lanigerum Stephani, Bull. Herb. Boiss. 6: 788. 1898.

Aytonia Evansii Haynes, Bull. Torrey Club 34: 57. 1907.

Thallus pale-green and glaucous, pigmented with purple below and along a narrow border above, mostly 1–2 cm. long and 5–7 mm. wide, with a broad rounded keel and plane or slightly canaliculate on the upper surface; branching sometimes dichotomous, sometimes ventral, often with apical innovations; epidermal cells mostly 18–30 μ in diameter, with small trigones and a waxy cuticle; pores not elevated and very inconspicuous, surrounded usually by

a single circle of 4–6 cells, the radial walls often somewhat thickened; green tissue fairly compact; ventral scales deep-purple with one or two, rarely three ovate-lanceolate to lanceolate appendages, acute to acuminate, entire, and slightly or not at all constricted at the base. Paroicous or autoicous; male receptacle sometimes borne on the same branch as the female, sometimes on a more or less elongate male branch; female receptacles borne singly or in a median longitudinal series, the stalk usually only 3 mm. long or less, the disc mostly 2–3 mm. wide, concave, with (usually) 2 or 3 apiculate lobes; the paleae abundant, narrowly subulate with elongate filiform points, entire; spores yellowish-brown, 70–90 μ in diameter, minutely rugulose with regular though often incomplete networks on the faces, the meshes mostly 15–20 μ wide; elaters about 10 μ wide, with 2–4 spirals, sometimes more or less coalescent.

TYPE LOCALITY: Madeira.

DISTRIBUTION: New Mexico and Arizona, south into Mexico; Jamaica; also in South America, Europe, the Atlantic Islands, Africa, Asia, and Australasia.

ILLUSTRATIONS: Nova Acta Acad. Leop.-Carol. 17: *pl.* 70, *f.* IV; Mem. Accad. Torino II. 18: *pl.* 1; Bull. Torrey Club 34: *pl.* 5; Rab. Krypt.-Fl. 6: *f.* 154, 155; Atti Ist. Veneto 75: *pl.* 20; Bull. Torrey Club 42: *f.* 1–4.

2. *Plagiochasma crenulatum* Gottsche, Danske

Vid. Selsk. Skr. V. 6: 362. 1863.

Aytonia crenulata Underw. Bot. Gaz. 20: 66. 1895.

Plagiochasma Muenchianum Stephani, Sp. Hep. 6: 9. 1917.

Thallus pale-green above but not glaucous, pigmented with purple below and along a narrow border above, mostly 1–3 cm. long and 5–10 mm. wide, with a broad rounded keel and undulate-crenate, more or less crispate margins, plane or broadly canaliculate on the upper surface; branching dichotomous and ventral, apical innovations lacking; epidermal cells about 30 μ in diameter, with distinct trigones and a thin smooth cuticle; pores slightly elevated, surrounded by about 6 radiating series of cells with 2 or 3 cells in each series, the radial walls slightly thickened; green tissue fairly compact; ventral scales purple, slightly imbricate, the appendages borne singly or rarely in pairs, broadly ovate, short-apiculate or abruptly acute, irregularly sinuate-dentate, sharply dentate, or even lobate at the base. Autoicous; male receptacle borne on a short ventral branch; female receptacles borne singly or in tandem pairs, the stalk 1–1.5 cm. long, the disc concave or bluntly indented with 2 or 3 apiculate lobes, the paleae lanceolate to narrowly ovate, irregularly sinuate or with an occasional tooth; spores yellowish-brown, about 80 μ in diameter, minutely verruculose, regularly reticulate, the meshes mostly 16–20 μ wide; elaters about 12 μ wide, mostly trispiral, the spirals often coalescent along one side.

TYPE LOCALITY: Puebla, Mexico.

DISTRIBUTION: Mexico.

ILLUSTRATION: Bull. Torrey Club 42: 291. *f.* 5.

3. *Plagiochasma jamaicense* (Haynes) Evans, Bull.

Torrey Club 42: 292. 1915.

Aytonia jamaicensis Haynes, Bull. Torrey Club 34: 58. 1907.

Thallus pale-green above but not glaucous, with a reddish-purple border below, about 1 cm. long and 5–7 mm. wide; with a broad rounded keel and crenulate, more or less crispate margins; branching rarely (if ever) dichotomous but usually ventral, apical innovations sometimes present; epidermal cells about 30 μ in diameter, with small but distinct trigones and a smooth cuticle; pores slightly elevated, surrounded by about 8 radiating series of cells with 2–4 cells in each series, the radial walls slightly thickened; green tissue fairly compact; ventral scales purple, slightly imbricate, with one or (rarely) two ovate appendages, apiculate and either entire or vaguely dentate or crenate, constricted and plicate at the base. Autoicous; male receptacle borne near the apex of a branch; female receptacles borne, usually in a series, on an apical innovation of a male branch, the stalk mostly 1–1.5 cm. long, the disc about 3 mm. wide, plano-concave, with 2–4 blunt lobes, the paleae lanceolate to linear-lanceolate, acuminate, entire or sparingly dentate; spores yellowish-brown, 70–85 μ in diameter, minutely verruculose, with irregular and often incomplete networks on the faces, the meshes mostly 16–20 μ wide; elaters about 8 μ wide, with 2 or 3 spirals, sometimes slightly coalescent.

TYPE LOCALITY: Chestervale, Blue Mountains, Jamaica.
 DISTRIBUTION: Known only from the type locality.
 ILLUSTRATIONS: Bull. Torrey Club 34: *pl.* 6.

4. *Plagiochasma Wrightii* Sull. in A. Gray, Man. ed. 2. 688. 1856.

Aytonia Wrightii Underw. Bull. Ill. Lab. Nat. Hist. 2: 43. 1884.

Thallus pale-green and glaucous above with a narrow purple border, plane or broadly canaliculate, purple below, mostly 1.5–2 cm. long and 3–5 mm. wide, with a broad rounded keel and undulate-crenate, more or less crispate margins; branching dichotomous or ventral, sometimes with apical innovations; epidermal cells about 22 μ in diameter, with distinct trigones and a thin waxy cuticle; pores slightly elevated, surrounded by about 6 radiating series of cells with 2 or 3 cells in each series, the radial walls distinctly thickened; green tissue rather loose; ventral scales purple, slightly imbricate, the appendages borne singly or in pairs, ovate-lanceolate, obtuse to acute, entire, more or less constricted and plicate at the base. Paroicous or autoicous; male receptacle borne behind a female receptacle or on a short ventral branch; female receptacles borne singly or in a short median row, the stalk mostly 2–4 mm. long, the disc about 3 mm. wide, narrowly concave at the apex, with 2 or 3 apiculate lobes, the paleae linear-lanceolate, acuminate, entire; spores brownish-yellow, 75–85 μ in diameter, minutely rugulose, regularly reticulate, the meshes mostly 15–20 μ wide; elaters 7–9 μ wide, with 2 or 3 spirals, often somewhat coalescent.

TYPE LOCALITY: Texas.

DISTRIBUTION: Oklahoma, Texas, Arizona and Mexico.

ILLUSTRATIONS: A. Gray, Man. ed. 2. *pl.* 6; Bull. Torrey Club 42: 297. *f.* 6.

5. *Plagiochasma Landii* Evans, Bull. Torrey Club 42: 298. 1915.

Thallus pale-green but not glaucous above, with a narrow purple border, plane or broadly canaliculate, purple below, with a broad rounded keel and undulate, slightly crispate margins, about 1 cm. long and 4–7 mm. wide; branching usually ventral, rarely dichotomous, apical innovations often present; epidermal cells about 28 μ in diameter, with small trigones and a thin smooth cuticle; pores slightly elevated, surrounded by 5–7 radiating series of cells with 2 or 3 cells in each series, the radial walls slightly thickened; green tissue fairly compact; ventral scales purple, with one or, less frequently, two subulate, acuminate, appendages, not constricted at the base, entire or rarely with a single sharp tooth. Paroicous; female receptacles usually borne singly, the stalk about 1 mm. long, the disc about 3 mm. wide, concave, with usually 2 short-apiculate and sometimes connivent lobes, the paleae lanceolate, acuminate, entire or sparingly dentate; spores yellowish-brown, mostly 70–80 μ in diameter, minutely verruculose, regularly reticulate, the meshes mostly 16–20 μ wide; elaters about 12 μ wide, with 2 or rarely 3 distinct spirals.

TYPE LOCALITY: Cuernavaca, Morelos.

DISTRIBUTION: Known only from the type locality.

ILLUSTRATIONS: Bull. Torrey Club 42: 300. *f.* 7.

6. *Plagiochasma intermedium* Lindenb. & Gottsche; G. L. N. Syn.
 Hep. 513. 1846.

Rupinia intermedia Trevisan, Mem. Ist. Lomb. 13: 437. 1877.

Aytonia intermedia Underw. Bot. Gaz. 20: 66. 1895.

Aytonia japonica Stephani, Bull. Herb. Boiss. 5: 84. 1897.

Plagiochasma japonicum Massal. Mem. Accad. Verona 73: 47. 1897.

Thallus pale-green above but not glaucous, with a narrow purple border, plane or broadly canaliculate, with a broad rounded keel and undulate-crenate margins, mostly 1–2 cm. long and 3–5 mm. wide, sometimes forking but usually innovating at the apex and often with ventral branches; epidermal cells about 25 μ in diameter, with small trigones and a thin smooth cuticle; pores distinctly elevated, surrounded by about 8 radiating series of cells with 2–4 cells in each series, the radial walls strongly thickened; green tissue loose; ventral scales purple with one or, more commonly, two lanceolate to ovate appendages, usually acute, entire, scarcely constricted at the base. Autoicous; male receptacles borne near the apex of a branch;

female receptacles borne singly or in a short median row, the stalk mostly 1–2 mm. long, the disc about 3 mm. wide, concave, with usually 2 or 3 apiculate lobes, the paleae lanceolate, acute to acuminate, usually entire; spores yellowish-brown, mostly 60–70 μ in diameter, minutely verruculose, sometimes reticulate and sometimes with only a few irregular surface-ridges not forming a network; elaters mostly 9–12 μ wide, the walls usually strongly and uniformly thickened, rarely showing traces of spiral hands.

TYPE LOCALITY: Hacienda de Jovo, Veracruz.

DISTRIBUTION: Mexico and Guatemala; also in Japan.

ILLUSTRATIONS: Bull. Torrey Club 42: 303. f. 8.

2. GRIMALDIA Raddi, Opusc. Sci. Bologna 2: 356. 1818.

Duvalia Nees, Ges. Nat. Freunde Berlin Mag. 8: 271. 1817. Not *Duvalia* Haworth, 1812.

Mannia Corda, in Opiz, Beitr. 646. 1829.

Sindonisce Corda, in Opiz, Beitr. 658. 1829.

Neesiella Schiffn. in E. & P. Nat. Pfl. 1³: 32. 1893.

Thallus dichotomous and also with apical innovations, sometimes with ventral branches, usually more or less pigmented with purple; texture varying from delicate to firm. Epidermis colorless or pale, composed of a single layer of cells with thin or thick walls and often with distinct trigones, cells containing oil-bodies sometimes present; pores surrounded by several radiating series of cells, the radial walls thin or more or less thickened; green tissue loose to compact, the dorsal chambers sparingly or closely subdivided by supplementary partitions. their margins sometimes bearing short teeth; ventral tissue composed of thin-walled cells without pits; cells containing oil-bodies present. Autoicous or dioicous. Antheridia borne on more or less distinct receptacles or forming irregular dorsal median groups, arising in acropetal succession from the base; associated epidermal pores simple. Female receptacles terminal, the stalk with a single rhizoid-furrow, the disc strongly convex above, with low, coarse tubercles, slightly or not at all lobed, the lobes when present mostly 3 or 4, the archegonia usually borne singly beneath the lobes or their equivalents; involucre membranous, not bilobed though sometimes less developed on side next stalk, reaching to the margin of the disc; pseudo-perianth lacking. Capsule with a distinct operculum remaining intact at dehiscence. Spores tetrahedral, with wings along the edges and with networks on the faces, at least on the spheric face; elaters with 2 or more spirals.

Type species, *Grimaldia dichotoma* Raddi.

Plants xerophytic in habit, the margins of the thallus strongly incurved when dry; green tissue compact.

Appendages of ventral scales forming a conspicuous white apical cluster, at least on fruiting plants; female receptacle commonly borne on an ordinary branch.

Appendages of ventral scales mostly purple, not forming a conspicuous apical cluster; female receptacle commonly borne on a short ventral branch.

Plants not xerophytic in habit, the margins of the thallus scarcely or not at all incurved when dry; green tissue loose.

Stalk of female receptacle with conspicuous clusters of paleae at base and apex.

Stalk of female receptacle with few or no paleae at base and apex.

1. *G. fragrans*.

2. *G. californica*.

3. *G. pilosa*.

4. *G. rupestris*.

1. *Grimaldia fragrans* (Balbis) Corda; Nees, Naturg. Eur.

Leberm. 4: 225. 1838.

Marchantia fragrans Balbis, Mém. Acad. Turin 7: 76. 1804.

Sindonisce fragrans Corda, in Opiz, Beitr. 648. 1829.

Grimaldia barbifrons Bisch. Nova Acta Acad. Leop.-Carol. 17: 1028. 1835.

Grimaldia inodora Wallr. Linnaea 14: 686. 1840.

Grimaldia sessilis Sull. in A. Gray, Man. ed. 2. 688. 1856.

Duvalia fragrans Lindb. Not. Sällsk. Faun. Fl. Fenn. 9: 285. 1868.

Thallus usually aromatic when fresh, deeply pigmented with purple below and along the margin, the upper surface usually green or glaucous-green in the middle, mostly 1–2 cm. long and 2–3 mm. wide, with a rounded or bluntly angled keel and undulate margins strongly incurved when dry; branching mostly dichotomous, rarely ventral; epidermal cells averaging about $17 \times 14 \mu$, with strongly thickened walls and usually with conspicuous trigones; cells containing oil-bodies lacking; pores slightly elevated, surrounded usually by 6–8 radiating series of cells with 2 or 3 cells in each series, the radial walls more or less thickened; green

tissue compact, the dorsal chambers with crowded, vertical supplementary partitions; ventral scales large, closely imbricate, lunulate and deep-purple, the appendages mostly two, rarely one or three, subulate, mostly 0.45–0.7 mm. long and 0.09–0.15 mm. wide, acuminate, entire, sometimes purple but usually more or less bleached, considerably larger on fruiting plants and forming a dense white apical cluster. Autoicous or dioicous; antheridia borne on a distinct receptacle, oval to broadly lunulate, limiting the growth of the more or less elongate male branch; female receptacle borne on a more or less elongate branch, the stalk mostly 1–1.5 cm. long, more or less pigmented, with dense clusters of long lanceolate paleae at base and apex, the disc mostly 2–3 mm. wide, shortly 3- or 4-lobed; spores yellowish-brown to brown, mostly 60–70 μ in diameter, with wavy wings 8–10 μ wide; spore-surface minutely and indistinctly punctulate, showing in addition a coarse and fairly regular reticulum on both spheric and plane faces, the meshes mostly 10–15 μ wide; elaters pale-brown to dark-brown, mostly 8–10 μ wide in the middle, usually with 2 or 3 spirals in the middle and 2 at the ends.

TYPE LOCALITY: Italy.

DISTRIBUTION: New England west to Colorado and south to Alabama, Texas, and New Mexico; also in Europe and northern Asia; on rocks, often more or less calcareous, and usually in exposed localities.

ILLUSTRATIONS: Mém. Acad. Turin 7: *pl. 2, f. 3*; Nova Acta Acad. Leop.-Carol. 17: *pl. 68, f. I*; Rab. Krypt.-Fl. 6: *f. 159a, 160, 161*; Atti Ist. Veneto 75: *pl. 18*.

EXSICCATAE: Aust. Hep. Bor.-Am. 133; Underw. & Cook, Hep. Am. 121; Haynes, Am. Hep. 68.

2. *Grimaldia californica* Gottsche; Underw.

Bot. Gaz. 13: 114. 1888.

Thallus green above in the middle, more or less pigmented with purple along the margin and beneath, mostly 1–2 cm. long and 2–4 mm. wide, with a rounded keel and undulate margins, strongly incurved when dry; branching dichotomous and also ventral, rarely with apical innovations; epidermal cells averaging about 23 μ in diameter, with slightly thickened walls and small but distinct trigones; cells containing oil-bodies lacking; pores somewhat elevated, surrounded usually by 5–7 radiating series of cells with 2 or 3 cells in each series, the radial walls scarcely thickened; green tissue compact, the dorsal chambers with crowded, vertical, supplementary partitions; ventral scales imbricate, lunulate to narrowly ovate, purple, the appendages borne in pairs or singly, subulate, mostly 0.3–0.4 mm. long and 0.07–0.09 mm. wide, acuminate, entire, usually purple, not forming a dense apical cluster. Autoicous or dioicous; antheridia forming an irregular and vaguely defined, elongate median cluster, not limiting the growth of the more or less elongate male branch; female receptacle borne on a short, obovate or cordate ventral branch, the stalk 1.5–2.5 cm. high, more or less pigmented with reddish, naked above but with a few slender scales at the base, the disc mostly 1.5–2 mm. wide, obscurely lobed, the lobes mostly 3 or 4; spores dark-purple, mostly 55–75 μ in diameter, with obscure wings about 4 μ wide; spore-surface minutely punctulate and showing in addition, at least on the spheric face, a series of low rounded ridges sometimes forming an irregular reticulum with meshes 12–16 μ wide; elaters purple, mostly 9–15 μ wide, usually trispiral.

TYPE LOCALITY: Yosemite Falls, California.

DISTRIBUTION: California; probably Arizona.

ILLUSTRATIONS: Mem. Torrey Club 7: *pl. 92*.

3. *Grimaldia pilosa* (Hornem.) Lindb. Musc. Scand. 1. 1879.

Marchantia pilosa Hornem. Fl. Dan. 8: 7. 1810.

Duvalia pilosa Lindb. Not. Sällsk. Faun. Fl. Fenn. 9: 280. 1868.

? *Grimaldia carnica* Massal. Ann. Ist. Bot. Roma 2: 54. 1886.

? *Neesiella carnica* Schiffn. Hedwigia 47: 314. 908.

Neesiella pilosa Schiffn. Hedwigia 47: 314. 1908.

Thallus purplish-brown beneath and sometimes along the margin above, otherwise green, mostly 1–2 cm. long and 3–4 mm. wide, with a rounded keel and wavy margins, not incurved when dry; branching mostly dichotomous, but apical innovations sometimes produced; epidermal cells averaging about 24×20 μ , thin-walled throughout or with more or less evident trigones; cells containing oil-bodies apparently lacking; pores slightly elevated, surrounded by 5–7 radiating series of cells with 2 or 3 cells in each series, the radial walls scarcely thickened;

green tissue loose, the dorsal chambers sparingly subdivided by supplementary partitions; ventral tissue occupying about one third the thickness of the thallus in the median portion; ventral scales large, pigmented with purple, imbricate, lunulate, the appendages borne singly or in pairs, subulate, acuminate, entire. Autoicous; antheridia forming a small but clearly defined receptacle with a few marginal paleae, terminal and usually situated on a short branch of a dichotomy; female receptacle borne on a similar short branch, the stalk mostly 2.5–4 cm. long, more or less pigmented with purple, with scattered slender paleae along the whole length and denser clusters at base and apex, the disc mostly 2–2.5 mm. wide, coarsely tuberculate, scarcely lobed, the archegonia mostly 3; spores yellowish-brown, mostly 60–70 μ in diameter with thick wavy wings about 5 μ wide; spore-surface, at least on the spheric face, with a coarse and fairly regular reticulum, the meshes mostly 8–10 μ wide, appearing tuberculate in profile view; elaters about 10 μ wide, usually trispiral.

TYPE LOCALITY: Norway.

DISTRIBUTION: Greenland; Alaska; Quebec; Vermont; also in Europe and Siberia; on rocks in arctic and alpine regions.

ILLUSTRATIONS: Fl. Dan. *pl.* 1426; Rab. Krypt.-Fl. 6: *f.* 163.

4. *Grimaldia rupestris* (Nees) Lindenb. Nova Acta Acad. Leop.-Carol. 14: Suppl. 108. 1829.

Duvalia rupestris Nees, Ges. Nat. Freunde Berlin Mag. 8: 271. 1817.

Neesiella rupestris Schiffn. in E. & P. Nat. Pfl. 1³: 33. 1893.

Thallus usually green throughout, sometimes slightly pigmented below, mostly 1–2 cm. long and 2–3 mm. wide, with a broad rounded keel and thin wavy margins, not incurved when dry; branching dichotomous and also occasionally ventral; epidermal cells averaging about $22 \times 16 \mu$, thin-walled throughout or with more or less distinct trigones; cells containing oil-bodies scattered; pores slightly elevated, surrounded by 6–8 radiating series of very thin-walled and short-lived cells, with 2 or 3 cells in each series; green tissue loose, the dorsal chambers sparingly subdivided by supplementary partitions; ventral tissue occupying about one third the thickness of the thallus in the median portion; ventral scales small, often somewhat pigmented, ovate, the appendages one or two, subulate, mostly 0.15–0.3 mm. long and 0.06–0.09 mm. wide, acute to acuminate, entire. Autoicous; antheridia forming a small but clearly defined receptacle with a very few narrow marginal paleae, terminal and usually situated on a short branch of a dichotomy; female receptacle borne on a similar short branch, the stalk mostly 1–3 cm. long, naked or with a few linear paleae at base and apex, the disc mostly 2–3 mm. wide, coarsely tuberculate, scarcely lobed, the archegonia mostly three; spores yellowish-brown, mostly 55–65 μ in diameter, with thick wavy wings about 4 μ wide; spore-surface indistinctly punctulate and showing in addition, at least on the spheric face, a coarse and fairly regular reticulum, formed by thick low ridges, the meshes mostly 10–12 μ wide, the spore-profile appearing tuberculate; elaters mostly 8–9 μ wide, with 2 or 3 more or less coalescent spirals.

TYPE LOCALITY: Germany.

DISTRIBUTION: Quebec and Vermont to Minnesota and southward to New York and Missouri; also in Europe and Japan; on rocks, largely or wholly calcareous.

ILLUSTRATIONS: Nova Acta Acad. Leop.-Carol. 17: *pl.* 68, *f.* 3; Rab. Krypt.-Fl. 6: *f.* 164, 165; Atti Ist. Veneto 75: *pl.* 14.

EXSICCATAE: Aust. Hep. Bor.-Am. 134.

3. *CRYPTOMITRIUM* Aust.; Underw. Bull. III. Lab. Nat. Hist. 2: 36. 1884.

Platycoaspis Lindb.; Lindb. & Arnell, Sv. Vet.-Akad. Handl. 23^b: 11. 1889.

Thallus dichotomous but sometimes with ventral branches and apical innovations, sometimes purple below but often green throughout, its texture delicate, the upper surface showing irregular polygons. Epidermis composed of a single layer of thin-walled cells without trigones, destitute of cells with oil-bodies; pores surrounded by several radiating series of cells with thin radial walls; green tissue loose, the dorsal air-chambers sparingly subdivided by supplementary partitions; ventral tissue composed of thin-walled cells. Paroicous. Antheridia forming a narrow median dorsal group anterior to the female receptacle; ostioles incon-

spicuous. Female receptacle terminal, the stalk naked, with a single rhizoid-furrow, the disc thin, soon becoming circular and slightly convex above, not lobed; archegonia in about 5 (3–7) radiating groups of 3 or 4 each; involucre deeply bilabiate, extending about half way to the margin; pseudoperianth lacking. Capsule with a distinct operculum, remaining intact at dehiscence. Spores brown, tetrahedral, with wings and surface-lamellae; elaters mostly bispiral.

Type species, *Marchantia tenera* Hook.

1. *Cryptomitrium tenerum* (Hook.) Aust.; Underw. Bull. III.

Lab. Nat. Hist. 2: 36. 1884.

Marchantia tenera Hook.; Kunth, Syn. Pl. 1: 45. 1822.

? *Duvalia Gayana* Mont. Ann. Sci. Nat. III. 4: 354. 1845.

Duvalia tenera Gottsche; G. L. N. Syn. Hep. 554. 1846.

? *Duvalia brevipedunculata* Mont.; G. L. N. Syn. Hep. 555. 1846.

Platycoaspis tenera Lindb.; Lindl. & Arnell, Sv. Vet.-Akad. Handl. 23: 11. 1889.

Thallus with a narrow rounded keel and very thin undulate-repand or crenate margins, not incurved when dry, mostly 0.5–1.5 cm. long and 3–9 mm. wide; epidermal cells averaging about $35 \times 25 \mu$; pores surrounded by about 8 radiating series of cells with 2 or 3 cells in each series; ventral tissue largely restricted to the keel; appendages of ventral scales filiform; stalk of female receptacle mostly 1.5–3 cm. long, the disc about 5 mm. wide; capsule subspheric; spores mostly 30–50 μ in diameter, the surface covered with an irregular network; elaters mostly 7–11 μ wide, closely bispiral or trispiral in the middle.

TYPE LOCALITY: Ario, Michoacan.

DISTRIBUTION: California and Mexico; probably also in Chile.

ILLUSTRATIONS: Mem. Torrey Club 7: pl. 93, 94.

EXSICCATAE: Haynes, Am. Hep. 31.

4. *REBOULIA* Raddi, Opusc. Sci. Bologna 2: 357. 1818. (*Rebouillia*.)

Strozzia S. F. Gray, Nat. Arr. Brit. Pl. 1: 682. 1821. (*Strozzius*).

Rhakiocarpon Corda, in Opiz, Beitr. 648. 1829.

Achiton Corda, in Opiz, Beitr. 649. 1829.

Otione Corda, in Opiz, Beitr. 649. 1829.

Thallus dichotomous and also with apical innovations, more or less pigmented with purple, its texture firm, the upper surface not divided into distinct polygons. Epidermis colorless or pale, composed of a single layer of cells with thin walls but distinct trigones, destitute of cells containing oil-bodies; pores surrounded by 6 or more radiating series of cells with thickened radial walls; green tissue rather loose but with the dorsal air-chambers more or less subdivided by supplementary partitions; ventral tissue composed of cells with more or less thickened, pitted walls. Paroicous, autoicous, or dioicous. Antheridia arising in acropetal succession on well-defined receptacles with compound pores, becoming dorsal in position, the male branch often continuing its growth directly or innovating. Female receptacle terminal, the branch often innovating in the absence of fertilization, the stalk with a single rhizoid-furrow, the disc strongly convex and distinctly lobed with usually a single archegonium under each lobe; involucre bilabiate; pseudoperianth lacking. Capsule with a distinct operculum, breaking into fragments at dehiscence. Spores tetrahedral, with anastomosing surface-folds; elaters with 2 or more spirals.

Type species, *Marchantia hemisphaerica* L.

1. *Reboulia hemisphaerica* (L.) Raddi, Opusc. Sci. Bologna 2: 357. 1818.

Marchantia hemisphaerica L. Sp. Pl. 1138. 1753.

Marchantia crinita Michx. Fl. Bor. Am. 2: 276. 1803.

Asterella hemisphaerica Beauv. Dict. Sci. Nat. 3: 257. 1805.

Marchantia barbata Link; Weber, Hist. Musc. Hep. Prodr. 104, as synonym. 1815.

Strozzia hemisphaerica S. F. Gray, Nat. Arr. Brit. Pl. 1: 682. 1821.

Achiton quadratum Corda, in Opiz, Beitr. 649. 1829.

Otione crinita Corda, in Opiz, Beitr. 649. 1829.

Grimaldia hemisphaerica Lindenb. Nova Acta Acad. Leop.-Carol. 14: Suppl. 106. 1829.

Marchantia fasciata Myrin; Lindenb. Flora 16: 174. 1833.

Grimaldia madeirensis Lindenb. Flora 16: 175. 1833.

- Fegatella hemisphaerica* Tayl. Trans. Linn. Soc. 17: 383. 1837.
Grimaldia ventricosa Wallr. Linnaea 14: 688. 1840.
Reboulia fasciata Nees; G. L. N. Syn. Hep. 549. 1846.
Reboulia javanica Nees; G. L. N. Syn. Hep. 549. 1846.
Fegatella microcephala Tayl. Lond. Jour. Bot. 5: 410. 1846.
Reboulia microcephala Nees; G. L. N. Syn. Hep. 790. 1847.
Reboulia Sullivantii Lehm. Stirp. Pug. 10: 24. 1857.
Reboulia longipes Sande-Lacoste, Ann. Mus. Bot. Lugd.-Bat. 3: 209. 1867.
Asterella hemisphaerica fasciata Lindb. Not. Sällsk. Faun. Fl. Fenn. 9: 286. 1868.
Asterella fasciata Trevisan, Mem. Ist. Lomb. 13: 439. 1877.
Asterella microcephala Trevisan, Mem. Ist. Lomb. 13: 439. 1877.
Asterella javanica Trevisan, Mem. Ist. Lomb. 13: 439. 1877.
Reboulia hemisphaerica paroica Massal. & Carest.; Massal. Ann. Ist. Bot. Roma 2: 53. 1886.
Reboulia hemisphaerica longilanata Lindb. & Arnell, Sv. Vet.-Akad. Handl. 23^s: 14. 1889.
Asterella longipes Mitt. Trans. Linn. Soc. II. 3: 205. 1891.
Reboulia hemisphaerica macrocephala Massal.; Sommier, Fl. Giglio 118. 1898.
Reboulia hemisphaerica javanica Schiffn. Denks. Akad. Wien 67: 155. 1898.
Reboulia hemisphaerica microspora Schiffn. Oesterr. Bot. Zeits. 58: 228. 1908.
Reboulia occidentalis Douin, Rev. Gén. Bot. 30: 144. 1918.
Reboulia Charrieri Douin, Rev. Gén. Bot. 30: 144. 1918.

Thallus usually green above in the middle and brownish-purple along the margins and beneath, mostly 1–3 cm. long and 6–7 mm. wide, with a narrow rounded keel and thin and undulate margins, scarcely or not at all incurved when dry; epidermal cells averaging about $50 \times 30 \mu$, the trigones usually with convex sides; pores elevated, with usually 4 or 5 cells in each radiating series; ventral tissue largely restricted to the keel; appendages of ventral scales usually 2, rarely 3, narrowly lanceolate or linear, mostly 0.7–0.9 mm. long and 0.06–0.1 mm. wide, long-acuminate, entire, composed of larger cells than the rest of the scale. Paroicous, autoicous, or dioicous; male receptacle sometimes at the base of the stalk of the female receptacle, sometimes terminating a separate branch, oval to broadly lunate, often deep-purple, a few slender marginal paleae sometimes present; stalk of female receptacle bearing at base and apex clusters of slender paleae, more or less pigmented below, mostly 1.5–3 cm. long, the disc mostly 3–4 mm. wide; capsule green; spores yellow or yellowish-brown, mostly $60\text{--}80 \mu$ in diameter, with wavy wings $6\text{--}10 \mu$ wide; spore-surface minutely punctulate and showing in addition a coarse and fairly regular network with meshes mostly $16\text{--}20 \mu$ wide; elaters yellow, mostly $10\text{--}12 \mu$ wide, bispiral throughout or trispiral in the middle.

TYPE LOCALITY: Europe.

DISTRIBUTION: Manitoba and British Columbia; widely distributed in the United States; Mexico; Bermuda and the West Indies; also in South America, Europe, Asia, Africa, and Australasia; on rocks, walls, and earth.

ILLUSTRATIONS: Micheli, Nov. Pl. Gen. *pl.* 2, *f.* 2; Dill. Hist. Musc. *pl.* 75, *f.* 2; Sturm, Deuts. Fl. Jungerm. *pl.* 19; Pearson, Hep. Brit. Isles *pl.* 210; Rab. Krypt.-Fl. 6: *f.* 156–158; Atti Ist. Veneto 75: *pl.* 19.

EXSICCATAE: Sull. Musci Alleg. 287; Aust. Hep. Bor.-Am. 132; Underw. & Cook, Hep. Am. 81, 181; Haynes, Am. Hep. 3.

5. ASTERELLA Beauv. Dict. Sci. Nat. 3: 257. 1805.

- Fimbriaria* Nees, Horae Phys. Berol. 45. 1820.
Hyphenantron Corda, in Opiz, Beitr. 648. 1829.
Rhacotheca Bisch.; Seubert, Fl. Azor. 12. 1844.
Octoskepos Griff. Not. Pl. Asiat. 2: 343. 1849.

Thallus at first dichotomous but later often with numerous ventral branches, usually more or less pigmented with purple; texture varying from delicate to firm. Epidermis colorless or pale-green, composed of a single layer of thin- or thick-walled cells with or without trigones; cells containing oil-bodies sometimes present; pores surrounded by 4–8 or more radiating series of cells with 2–5 cells in each series, the radial walls sometimes distinctly thickened; green tissue loose to compact, the air-chambers sometimes undivided, sometimes sparingly or closely subdivided by supplementary partitions, their margins often bearing short teeth; ventral tissue composed of parenchyma, with or without pits in the walls, with scattered cells containing oil-bodies, rarely with slime-cells. Autoicous, paroicous, or dioicous. Antheridia borne on more or less distinct receptacles, or forming an irregular median group, borne in acropetal succession from the base; associated epidermal pores simple. Female receptacle terminal, the stalk with a single rhizoid-furrow, the disc flat to strongly convex or conic, smooth to coarsely tuberculate, slightly to strongly lobed, the archegonia usually borne singly, more rarely in short rows, beneath the lobes; involucre membranous, undivided

to bilabiate, entire or nearly so; pseudoperianth conspicuous, consisting of a membranous, white to purple, inflated tube contracted at the mouth, soon becoming deeply split into three to twenty narrow segments usually remaining attached at their tips. Capsule with a distinct operculum, remaining intact or breaking into fragments at dehiscence, without a definite suture. Spores tetrahedral, with wings along the edges and with ridges or other markings on the faces; elaters with one or more spirals.

Type species, *Marchantia tenella* L.

Branching largely or wholly dichotomous, even at maturity.

Dorsal air-chambers not subdivided by supplementary partitions.

Cells with oil-bodies present in the epidermis; segments of pseudoperianth becoming free with age; spores yellow, coarsely reticulate.

Female receptacle distinctly lobed, smooth or nearly so; spores mostly 80–90 μ in diameter.

Female receptacle scarcely lobed, covered with low and coarse tubercles; spores mostly 60–65 μ in diameter.

Cells with oil-bodies lacking in the epidermis; segments of pseudoperianth remaining attached; spores dark-brown to nearly black, not coarsely reticulate.

Autoicous; female receptacle hemispheric, with low and coarse tubercles and short but distinct lobes; pseudoperianths extending obliquely outward.

Paroicous; female receptacle bluntly conic, smooth or nearly so, scarcely lobed; pseudoperianths extending almost vertically downward.

Dorsal air-chambers more or less subdivided by supplementary partitions.

Plants xerophytic in habit, the margins of the thallus strongly incurved when dry.

Appendages of ventral scales one or two, forming a conspicuous white cluster at the tip of the thallus; monoicous; faces of spore without ridges.

Appendages of ventral scales (mostly) two to four, not forming a conspicuous white cluster at the tip of the thallus; dioicous; faces of spore with coarse ridges.

Plants not xerophytic in habit, the margins of the thallus scarcely or not at all incurved when dry.

Keel sharp; pseudoperianth with purple segments.

Keel rounded; pseudoperianth white or pale throughout.

Thallus delicate, 1.5–4 mm. broad, the margin not closely undulate-crispate.

Thallus firm, 8–10 mm. broad, the margin closely undulate-crispate.

Branching largely or wholly ventral at maturity; dorsal air-chambers subdivided by numerous supplementary partitions.

Plants not xerophytic, the margins of the thallus scarcely or not at all incurved when dry.

Male branches variable in length; spores with coarse reticula on the faces, the meshes 8–20 μ in diameter.

Meshes on spore-surface mostly 15–20 μ in diameter.

Tubercles of female receptacle less than 0.5 mm. long.

Tubercles of female receptacle 0.5–1 mm. long.

Meshes on spore-surface mostly 8–12 μ in diameter.

Male branches short; spores with fine and irregular reticula on the faces, the meshes mostly 2–8 μ in diameter.

Plants more or less xerophytic, the margins incurved when dry; sexual branches short; spores with coarse reticula on the faces, the meshes mostly 15–20 μ in diameter.

Pseudoperianth mostly 8–10-cleft; reticula on spore-surfaces rarely involving the wings; elaters mostly 12–14 μ wide.

Pseudoperianth mostly 10–16-cleft; reticula on spore-surfaces usually involving the wings; elaters mostly 8–12 μ wide.

1. *A. tenella*.

2. *A. Ludwigii*.

3. *A. Pringlei*.

4. *A. Palmeri*.

5. *A. saccata*.

6. *A. californica*.

7. *A. Lindenbergiana*.

8. *A. venosa*.

9. *A. rugosa*.

10. *A. elegans*.

11. *A. echinella*.

12. *A. reticulata*.

13. *A. versicolor*.

14. *A. lateralis*.

15. *A. Bolanderi*.

1. *Asterella tenella* (L.) Beauv. Dict. Sci. Nat. 3: 257. 1805.

Marchantia tenella L. Sp. Pl. 1137. 1753.

Fimbriaria tenella Nees, Horae Phys. Berol. 45. 1820.

Fimbriaria nigripes Bisch.; Lehm. Stirp. Pug. 6: 19. 1834.

Fimbriaria tenella porphyrocephala Bisch. Nova Acta Acad. Leop.-Carol. 17: 1023. 1835.

Fimbriaria tenella brachypus G. L. N. Syn. Hep. 563. 1846.

Fimbriaria brachypus Mont.; G. L. N. Syn. Hep. 563, as synonym. 1846.

Fimbriaria mollis Tayl. Lond. Jour. Bot. 5: 411. 1846.

Hypenanthron tenellum Trevisan, Mem. Ist. Lomb. 13: 440. 1877.

Hypenanthron molle Trevisan, Mem. Ist. Lomb. 13: 441. 1877.

Thallus bright-green, often pigmented with purple beneath and along the margin, mostly 0.5–1.5 cm. long and 1.5–3 mm. wide, with a rounded keel and thin undulate margins, branching almost invariably by forking; epidermal cells averaging about $40 \times 25 \mu$ with slightly thickened walls, the trigones sometimes distinct; cells containing oil-bodies few and scattered; pores slightly or not at all elevated, surrounded by about 6 radiating series of cells with 2 or 3 cells in each series, the radial walls thin; green tissue loose, the air-chambers not subdivided, each dorsal chamber with a pore; appendages of ventral scales one or two, narrowly to broadly ovate, mostly 0.25–0.45 mm. long and 0.15–0.3 mm. wide, acute to rounded, the margin entire or somewhat dentate. Paroicous; antheridia forming a small group anterior to the female receptacle; stalk of female receptacle naked, often purple, about 2 cm. long, the disc 2–4 mm. wide, hemispheric, smooth or nearly so, shortly lobed, the lobes mostly 4, extending obliquely downward; involucre deeply bifid, entire or irregularly sinuate or crenate; pseudoperianth mostly 8–10-cleft, white or yellowish or purplish, the segments finally free, ovate to lanceolate; operculum remaining intact at dehiscence; spores yellow, mostly $80\text{--}90 \mu$ in diameter with wavy wings $8\text{--}15 \mu$ wide; spore-surfaces covered with fine and irregular lines and also with coarse ridges, forming a reticulum on the spheric face with meshes $16\text{--}18 \mu$ wide; elaters yellow, mostly $10\text{--}12 \mu$ wide, bispiral in the middle and unispiral at the ends.

TYPE LOCALITY: Virginia.

DISTRIBUTION: Maine to Ontario, and southward to Georgia, Louisiana, and Texas; on banks and damp rocks in the lowlands.

ILLUSTRATIONS: Dill. Hist. Musc. *pl.* 75, *f.* 4; Nova Acta Acad. Leop.-Carol. 17: *pl.* 69, *f.* II.

EXSICCATAE: Aust. Hep. Bor.-Am. 136; Underw. & Cook. Hep. Am. 44.

2. *Asterella Ludwigii* (Schwaegr.) Underw. Bot. Gaz. 20: 61. 1895.

Marchantia tenella Retz. Fl. Scand. Prodr. ed. 2. 270. 1795. Not *M. tenella* L. 1753.

Marchantia pilosa Wahlenb. Fl. Lapp. 399. 1812. Not *M. pilosa* Hornem. 1810.

Marchantia Ludwigii Schwaegr. Hist. Musc. Hep. Prodr. 33. 1814.

Marchantia gracilis Weber f. Hist. Musc. Hep. Prodr. 105. 1815.

Fimbriaria nana Lindenb. Nova Acta Acad. Leop.-Carol. 14: Suppl. 109. 1829.

Marchantia nana Schleich.; Lindenb. Nova Acta Acad. Leop.-Carol. 14: Suppl. 110, as synonym. 1829.

Fimbriaria pilosa Tayl. Trans. Linn. Soc. 17: 386. 1837.

Fimbriaria gracilis Lindb. Not. Sällsk. Faun. Fl. Fenn. 10: 282. 1868.

Asterella pilosa Trevisan, Rend. Ist. Lomb. II. 7: 785. 1874.

Fimbriaria Ludwigii Limpr.; Cohn, Krypt.-Fl. Schlesien 1: 340. 1876.

Hypnantron gracile Trevisan, Mem. Ist. Lomb. 13: 440. 1877.

Hypnantron nanum Trevisan, Mem. Ist. Lomb. 13: 440. 1877.

Hypnantron pilosum Kuntze, Rev. Gen. 89. 1891.

Asterella gracilis Underw. Bot. Gaz. 20: 61. 1895.

Fimbriaria Macounii Stephani, Bull. Herb. Boiss. 7: 99. 1899.

Thallus green, often pigmented with purple beneath and along the margin, mostly 0.5–1.5 cm. long and 1–2 mm. wide, but often 3–5 mm. wide on fertile plants, with a rounded keel and thin undulate margins, branching by forking; epidermal cells averaging about $25 \times 20 \mu$, usually with slightly thickened walls and more or less distinct trigones; cells containing oil-bodies few and scattered; pores slightly elevated, surrounded by about 6 radiating series of cells with 2 cells in each series; green tissue loose, the air-chambers not subdivided, each dorsal chamber with a pore; appendages of ventral scales one or (rarely) two, lanceolate to ovate, mostly 0.2–0.6 mm. long and 0.15–0.3 mm. wide, mostly acute to acuminate, rarely blunt, the margin entire or nearly so. Paroicous; antheridia forming a small group anterior to the female receptacle; stalk of female receptacle naked or with a few scattered paleae, often purple, mostly 2–3 cm. long, the disc about 2 mm. wide, hemispheric, covered with low tubercles, the lobes mostly three, scarcely evident, extending obliquely downward; involucre narrow, entire or nearly so; pseudoperianth hyaline, mostly 8-cleft, the segments soon becoming free, narrowly lanceolate; operculum remaining intact at dehiscence; spores yellow, mostly $60\text{--}65 \mu$ in diameter, with wavy wings $6\text{--}10 \mu$ wide; spore-surfaces minutely and often indistinctly punctulate and also covered by coarse ridges, usually forming a reticulum on the spheric face and often on the plane faces, with meshes $9\text{--}12 \mu$ wide; elaters yellow, mostly $8\text{--}10 \mu$ wide, mostly bi- or trispiral in the middle and bispiral at the ends.

TYPE LOCALITY: Europe.

DISTRIBUTION: Greenland; Montana to British Columbia, and southward to Colorado and California; also in Europe and Asia; on rocks and banks in arctic and alpine regions.

ILLUSTRATIONS: Trans. Linn. Soc. 17: *pl.* 13, *f.* 3; Rab. Krypt.-Fl. 6: *f.* 168; Atti Ist. Veneto 75: *pl.* 10.

EXSICCATAE: Macoun, Can. Hep. 72, 73; Haynes, Am. Hep. 106; Macoun, Can. Liv. 4.

3. *Asterella Pringlei* Underw. Bot. Gaz. 20: 64. 1895.

Fimbriaria Pringlei Stephani, Bull. Herb. Boiss. 7: 96. 1899. (Not *F. Pringlei* Stephani, 1909.)

Thallus sometimes green throughout but usually more or less pigmented with purple beneath, becoming brownish with age, mostly 1–1.5 cm. long and 3.5 mm. wide, with a rounded keel and thin, undulate, more or less crispate margins, the branching dichotomous; apical innovations occasionally present; epidermal cells averaging about $40 \times 25 \mu$, thin-walled and without trigones; cells containing oil-bodies not present; pores somewhat elevated, surrounded by 4–6 radiating series of cells with 2 cells in each series, the cells next the opening with more or less thickened radial walls; green tissue compact below, looser above, the air-chambers not subdivided, each dorsal chamber with a pore; compact ventral tissue thin-walled and destitute of pits; appendages of ventral scales one or (rarely) two, broadly subulate, mostly 0.7–1 mm. long and 0.15–0.45 mm. wide, at the base acute to short-acuminate, the margin entire to irregularly spinose-dentate, bearing more or less persistent slime-papillae. Autoicous; male inflorescence consisting of a long, narrow, median, dorsal cluster without paleae; stalk of female receptacle naked, yellow to brown, mostly 1–1.5 cm. long, the disc mostly 3–4 mm. wide, green to purple, hemispheric, covered with low tubercles, mostly 4-lobed, the lobes short but distinct, extending obliquely downward; involucre entire or nearly so; pseudoperianth pale or white, mostly 12–16-cleft, the segments connate at their tips, lanceolate; operculum intact at dehiscence; spores dark-brown, sometimes almost opaque, mostly $80\text{--}120 \mu$ in diameter with wings $6\text{--}8 \mu$ wide; spore-surface covered over with fine and irregular ridges $1\text{--}2 \mu$ high and sometimes with low and broader folds about 4μ high, the latter never forming a reticulum; elaters brown, mostly $12\text{--}16 \mu$ wide, sometimes unispiral throughout but usually bispiral in the middle.

TYPE LOCALITY: Near Guadalajara, Jalisco.

DISTRIBUTION: Central Mexico; on damp banks and rocks.

4. *Asterella Palmeri* (Aust.) Underw. Bot. Gaz. 20: 63. 1895.

Fimbriaria Palmeri Aust. Bull. Torrey Club 6: 47. 1875.

Fimbriaria nudata M. A. Howe, Erythea 1: 112. 1893.

Asterella nudata Underw. Bot. Gaz. 20: 61. 1895.

Thallus green above but more or less pigmented with purple beneath and along the margin, mostly 0.5–1 cm. long and 2–4 mm. wide, with a rounded keel and undulate, crispate, somewhat scarious margins becoming strongly incurved when dry, the branching dichotomous; epidermal cells averaging about $35 \times 25 \mu$, thin-walled and without trigones; cells containing oil-bodies not present; pores elevated, surrounded usually by 6 radiating series of cells with 2 cells in each series, the cells next the opening with more or less thickened radial walls; green tissue compact, the air-chambers not subdivided, those of the dorsal layer vertically elongate, each with a pore; compact ventral tissue composed of thin-walled cells without pits; appendages of ventral scales one or (rarely) two, broadly to narrowly subulate, mostly 0.5–0.9 mm. long and 0.1–0.25 mm. wide, acuminate, the margin entire to sparingly dentate. Paroicous; antheridia forming a small group anterior to the female receptacle; stalk of female receptacle naked, more or less brownish, mostly 1–2 cm. long, the disc obtusely conic, about 4 mm. high and 2.5–4 mm. wide, smooth or nearly so, scarcely lobed; involucre entire or nearly so, narrow; pseudoperianths mostly three or four, extending vertically downward, white, 8–12-cleft, the segments connate at their tips, lanceolate; operculum remaining intact at dehiscence; spores dark-brown to almost black, $60\text{--}80 \mu$ in diameter, with low wavy folds about 5μ wide along the edges and with similar folds on the spore-faces, the latter folds (sometimes reduced to tubercles) crowded and interwoven but not forming a network; spore-surface otherwise smooth or obscurely punctulate; elaters pale-brown to dark-brown, mostly $12\text{--}14 \mu$ in diameter, sometimes unispiral throughout but usually bispiral in the middle.

TYPE LOCALITY: Guadalupe Island, Lower California.

DISTRIBUTION: California and Lower California.

ILLUSTRATIONS: Mem. Torrey Club 7: pl. 99, f. 1–15.

5. *Asterella saccata* (Wahlenb.) Evans, Contr.
U. S. Nat. Herb. 20: 276. 1920.

- Marchantia fragrans* Schleich. [Pl. Crypt. Exsic. Helvet. 3: 64; hyponym. 1804]; DC. Fl. Fr. 2: 423. 1805. Not *M. fragrans* Balbis, 1804.
Marchantia saccata Wahlenb. Ges. Nat. Freunde Berlin Mag. 5: 296. 1811.
Fimbriaria saccata Nees, Horae Phys. Berol. 45. 1820.
Fimbriaria fragrans Nees, Horae Phys. Berol. 45. 1820.
Hypenanthron ciliatum Corda, in Opiz, Beitr. 648. 1829.
Marchantia umbonata Wallr. Linnaea 14: 686. 1840.
Fimbriaria umbonata Wallr.; G. L. N. Syn. Hep. 559. 1846.
Asterella fragrans Trevisan, Rend. Ist. Lomb. II. 7: 785. 1874.
Hypenanthron fragrans Trevisan, Mem. Ist. Lomb. 13: 440. 1877.
Hypenanthron umbonatum Trevisan, Mem. Ist. Lomb. 13: 440. 1877.
Hypenanthron saccatum Trevisan, Mem. Ist. Lomb. 13: 440. 1877.

Thallus green above in the middle but more or less pigmented with purple beneath and along the margin, mostly 0.5–1 cm. long and 2–3 mm. wide, with a rounded or bluntly angled keel and undulate margins, strongly incurved when dry, the branching dichotomous; epidermal cells averaging about $30 \times 20 \mu$, the walls more or less thickened and with distinct trigones; cells containing oil-bodies few and scattered; pores more or less elevated, surrounded by about 6 radiating series of cells with 2 or 3 cells in each series, the radial walls thin or with trigones; green tissue fairly loose, the dorsal air-chambers subdivided by supplementary partitions and apparently more numerous than the pores; compact ventral tissue composed of thin-walled cells without pits; appendages of ventral scales one or two, sometimes more or less connate, subulate, mostly 0.7–1 mm. long and 0.2–0.3 mm. wide, long-acuminate, the margin entire to sparingly and irregularly dentate or spinose-dentate, hyaline and forming a dense apical cluster. Paroicous or autoicous; antheridia forming an elongate, median, dorsal cluster anterior to the female receptacle or on a separate branch; stalk of female receptacle with a dense basal cluster of hyaline, lanceolate scales, otherwise naked, more or less pigmented, about 2 cm. long; disc bluntly conic. about 3 mm. wide, covered with low tubercles, shortly 3- or 4-lobed, the lobes extending almost vertically downward; involucre entire to sinuate; pseudoperianth white, mostly 8-cleft, the segments connate at their tips, lanceolate; operculum remaining intact at dehiscence; spores brownish-yellow, 80–90 μ in diameter, with wavy wings 10–12 μ wide; spore-surfaces covered over with a very fine and often regular reticulum, the meshes about 2 μ wide, formed by delicate lines, otherwise smooth or with occasional low folds or tubercles never forming a reticulum; elaters yellowish-brown, mostly 10–14 μ wide, sometimes unispiral throughout, sometimes bi- or trispiral in the middle.

TYPE LOCALITY: Kamchatka.

DISTRIBUTION: Yukon, British Columbia, Idaho, and Washington; also in Europe and Asia.

ILLUSTRATIONS: Ges. Nat. Freunde Berlin Mag. 5: pl. 7, f. 3; Nova Acta Acad. Leop.-Carol. 17: pl. 69, f. III; Rab. Krypt.-Fl. 6: f. 167; Atti Ist. Veneto 75: pl. 13.

6. *Asterella californica* (Hampe) Underw. Bot. Gaz. 20: 60. 1895.

- Sauteria limbata*. Aust. Proc. Acad. Phila. 1869: 229, in part. 1870.
Fimbriaria californica Hampe; Aust. Hep. Bor.-Am. 33. 1873.
Fimbriaria Lescurii Aust. Hep. Bor.-Am. 33, as synonym. 1873.
Clevea limbata Solms; Stephani, Bull. Herb. Boiss. 6: 773, in part. 1898.

Thallus green above in the middle but usually more or less pigmented with purple beneath and along the margin, mostly 1.5–2 cm. long and 7–10 mm. wide, with a rounded keel and undulate margins, more or less incurved when dry, the branching dichotomous; epidermal cells averaging about $50 \times 30 \mu$, thin-walled but sometimes with minute trigones; cells containing oil-bodies few and scattered; pores slightly elevated, surrounded usually by 6 radiating series of cells with 3 cells in each series, the radial walls more or less thickened; green tissue rather loose, the dorsal air-chambers somewhat subdivided by vertical supplementary partitions and apparently more numerous than the pores; compact ventral tissue composed of thin-walled cells without pits, scattered slime-cells occasionally present; appendages of ventral scales mostly 2–4, usually narrowly subulate, mostly 0.6–0.9 mm. long and 0.08–0.15 mm. wide, acuminate, the margin entire or with a sharp tooth or lobe. Dioicous; antheridia forming an elongate, median, dorsal cluster, sometimes forked; paleae occasionally present; stalk of female receptacle naked or nearly so, brownish or purplish, 1–3 cm. long; disc green,

low-hemispheric, about 5 mm. wide, almost smooth, deeply lobed, the lobes usually 4, extending obliquely outward; involucre almost bipartite, entire or slightly toothed; pseudoperianth white or rarely purplish, mostly 12–16-cleft, the segments connate at the tips, lanceolate; operculum breaking into fragments at dehiscence; spores yellow, mostly 100–120 μ in diameter with wavy wings 12–20 μ wide; spore-surface covered over with a fine and often irregular reticulum, the meshes 3–4 μ wide formed by very low ridges, the faces showing in addition a few broad and rounded irregular ridges, not forming a network; elaters yellow, mostly 12–16 μ wide, sometimes unispiral throughout, sometimes bispiral in the middle.

TYPE LOCALITY: California.

DISTRIBUTION: Arizona, California, and Guadalupe Island.

ILLUSTRATIONS: Mem. Torrey Club 7: *pl.* 95, 96.

EXSICCATAE: Aust. Hep. Bor.-Am. 135; Underw. & Cook, Hep. Am. 119.

7. *Asterella Lindenberiana* (Corda) Lindb. Musci Scand. 1. 1879.

Fimbriaria Lindenberiana Corda; Nees, Naturg. Eur. Leberm. 4: 283. 1838.

Fimbriaria Bonjeanii De-Not. Mem. Accad. Torino II. 1: 335. 1839.

Asterella Bonjeanii Trevisan, Rend. Ist. Lomb. II. 7: 785. 1874.

Hypenanthron Bonjeanii Trevisan, Mem. Ist. Lomb. 13: 440. 1877.

Hypenanthron Lindenberianum Kuntze, Rev. Gen. 89. 1891.

Fimbriaria commutata Stephani, Bull. Herb. Boiss. 7: 202. 1899.

Thallus sometimes green above but often more or less pigmented with purple on both surfaces, mostly 1–3 cm. long and 4–6 mm. wide, with a narrow, often sharp keel and thin undulate-crispate margins, somewhat incurved when dry, usually with a shallow median groove, the branching dichotomous; epidermal cells averaging about $35 \times 25 \mu$, thin-walled and without trigones; cells containing oil-bodies few and scattered; pores slightly elevated, surrounded usually by 6 or 7 radiating series of cells with 3 or 4 cells in each series, the radial walls slightly thickened; green tissue fairly loose, the dorsal air-chambers sparingly subdivided by supplementary partitions and apparently more numerous than the pores; compact ventral tissue composed of cells with slightly thickened, pitted walls; appendages of ventral scales mostly one or two, rarely three, lanceolate, mostly 0.25–0.4 mm. long and 0.08–0.12 mm. wide, acute to acuminate, entire or nearly so. Paroicous or autoicous; antheridia forming an oval median dorsal cluster anterior to the female receptacle or on a separate branch; stalk of female receptacle with a loose cluster of narrow paleae at base and apex, deeply pigmented, about 2 cm. long, the disc bluntly conic, 3–4 mm. wide, with low tubercles, shortly lobed, the lobes mostly 3 or 4, extending obliquely downward; involucre narrow, bilobed, entire or nearly so; pseudoperianth usually deep-purple, mostly 12–16-cleft, the segments connate at the tips, lanceolate; spores dark-purple, mostly 80–100 μ in diameter, with wavy and often loose wings 10–14 μ wide; spore-surfaces covered over with a fine reticulum, the meshes 4–6 μ wide, otherwise without markings; elaters purple, mostly 12–16 μ wide, sometimes bispiral throughout but often unispiral at the ends.

TYPE LOCALITY: Salzburg.

DISTRIBUTION: Alaska to Washington and eastward to Alberta; also in Europe.

ILLUSTRATIONS: Mem. Accad. Torino II. 1: *pl.* 1, *fig. e*; Rab. Krypt.-Fl. 6: *f.* 8, 16, 169; Atti Ist. Veneto 75: *pl.* 12.

8. *Asterella venosa* (Lehm. & Lindenb.) Evans, Contr. U. S. Nat. Herb. 20: 286. 1920.

Fimbriaria venosa Lehm. & Lindenb.; Lehm. Stirp. Pug. 4: 29. 1832.

Hypenanthron venosum Trevisan, Mem. Ist. Lomb. 13: 441. 1877.

Thallus very delicate, sometimes green throughout but not infrequently more or less tinged with purple, mostly 1–2 cm. long and 2.5–4 mm. wide, with a rounded keel and thin, slightly crispate margins, not incurved when dry; branching dichotomous, but apical innovations sometimes present; epidermal cells averaging about $35 \times 25 \mu$, thin-walled but sometimes with trigones; cells containing oil-bodies few and scattered; pores slightly elevated, surrounded usually by 7 or 8 radiating series of cells with 2 or 3 cells in each series; radial walls thin or slightly thickened, sometimes with trigones; green tissue loose, the dorsal air-chambers sparingly subdivided by supplementary partitions and apparently more numerous than the pores; compact ventral tissue composed of thin-walled cells without pits; appendages of

ventral scales borne singly, subulate, mostly 0.25–0.4 mm. long and 0.12–0.18 mm. wide, acute to acuminate, entire. Paroicous; antheridia forming a small, median, dorsal cluster anterior to the female receptacle; stalk of female receptacle with scattered slender paleae and a denser apical cluster, green throughout or purple at the base, the disc flat or with a slightly elevated center, mostly 3–4 mm. wide, with low tubercles, usually 4-lobed, the lobes almost horizontal; involucre vaguely sinuate-crenate, barely reaching the margins of the lobes; pseudoperianth white or yellow, directed obliquely downward, mostly 8–10-cleft, the segments connate at the tips, narrowly lanceolate; operculum remaining intact at dehiscence; spores yellowish-brown, translucent, mostly 55–65 μ in diameter, with wavy wings 8–10 μ wide; spore-surface covered over with a fine and irregular network, the meshes mostly 1–4 μ wide, otherwise without markings; elaters pale-yellow, mostly 6–8 μ wide, bispiral throughout or unispiral at the ends.

TYPE LOCALITY: Brazil.

DISTRIBUTION: Mexico; also in Brazil.

9. *Asterella rugosa* Evans, Contr. U. S. Nat. Herb. 20: 289. 1920.

Thallus sometimes green throughout but usually somewhat pigmented with purple beneath and along the margin, mostly 1.5–2 cm. long and 8–10 mm. wide, with a narrow rounded keel and crenate, closely undulate-crispate margins not incurved when dry; branching mostly dichotomous, but apical innovations and lateral ventral branches sometimes present; epidermal cells averaging about $30 \times 25 \mu$, thin-walled but with distinct trigones; cells containing oil-bodies very few, scattered; pores slightly elevated, surrounded usually by 6 radiating series of cells with 3 or 4 cells in each series, the radial walls with trigones; green tissue loose, the dorsal air-chambers sparingly subdivided by supplementary partitions and apparently more numerous than the pores; compact ventral tissue composed of thin-walled cells without pits; appendages of ventral scales one or two, subulate from a broad base, mostly 0.45–0.6 mm. long and 0.15–0.2 mm. wide, acuminate, mostly entire but sometimes with one or two coarse teeth. Dioicous; antheridia forming a narrow, median, dorsal cluster, without paleae; stalk of female receptacle with a loose apical cluster of slender paleae, otherwise naked, not pigmented, about 1 cm. long, the disc slightly convex, mostly 3–4 mm. wide, scarcely or not at all lobed; pseudoperianths mostly 4, extending almost vertically downward, white or brownish, mostly 12–14-cleft, the segments connate at the tips, lanceolate; spores brown, mostly 80–90 μ in diameter, with paler, wavy wings 8–10 μ wide; spore-surface covered with a fine and irregular reticulum, the meshes about 10 μ wide, otherwise without markings; elaters brown, mostly 12–18 μ wide, mostly bispiral in the middle and unispiral at the ends.

TYPE LOCALITY: La Cima, Federal District, Mexico.

DISTRIBUTION: Known only from the type locality.

10. *Asterella elegans* (Spreng.) Trevisan, Rend.

Ist. Lomb. II. 7: 785. 1874.

Fimbriaria elegans Spreng. Syst. 4: 235. 1827.

Fimbriaria cubanensis Lehm.; Mont. in Sagra, Hist. Cuba 9: 489. 1845.

Fimbriaria elegans cubensis G. L. N. Syn. Hep. 565. 1846.

Hyphenantron elegans Trevisan, Mem. Ist. Lomb. 13: 441. 1877.

Asterella cubensis Underw. Bot. Gaz. 20: 63. 1895.

Asterella Austini Underw. Bot. Gaz. 20: 64. 1895.

Asterella Wrightii Underw. Bot. Gaz. 20: 64. 1895.

Fimbriaria Wrightii Stephani, Bull. Herb. Boiss. 7: 97. 1899.

Fimbriaria Austini Stephani, Bull. Herb. Boiss. 7: 203. 1899.

Thallus usually green above in the middle and purple beneath and along the margin, mostly 1–3 cm. long and 2–4 mm. wide, with a rounded keel and undulate, often crispate margins, scarious when old but scarcely or not at all incurved when dry, rarely dichotomous, usually branching ventrally and with apical innovations; epidermal cells averaging about $50 \times 30 \mu$, with slightly thickened walls, sometimes with minute trigones; cells containing oil-bodies few and scattered; pores elevated, surrounded usually by 6–8 radiating series of cells with 3 or 4 cells in each series; radial walls slightly thickened; green tissue compact, the dorsal air-chambers with crowded, vertical, supplementary partitions; compact ventral

tissue composed of cells with more or less thickened walls and distinct pits; appendages of ventral scales usually single, rarely in pairs, narrowly lanceolate to subulate, mostly 0.6–0.9 mm. long and 0.09–0.15 mm. wide, acuminate, entire or rarely with a spine-like basal tooth. Autoicous; male receptacle terminal on a more or less elongate branch, sometimes with an apical innovation, oval or emarginate, fringed by narrow paleae; female receptacle borne on a similar branch, the stalk more or less purple, with scattered lanceolate paleae and a denser apical cluster, mostly 1–1.5 cm. long, the disc hemispheric, mostly 3–4 mm. wide, coarsely tuberculate, the tubercles less than 0.5 mm. long, normally four-lobed, the lobes short but distinct, extending obliquely downward; involucre entire or sinuate; pseudoperianth usually white to brownish but sometimes tinged with purple, mostly 8-cleft, the segments connate at the tips, lanceolate; operculum remaining intact at dehiscence; spores pale- to dark-brown, mostly 80–100 μ in diameter with wavy wings 8–20 μ wide, spore-surface minutely and irregularly punctulate and also covered with a coarse and usually regular network, the meshes 15–20 μ wide; elaters pale-brown to dark-brown, mostly 12–14 μ wide, sometimes unispiral or bispiral throughout but usually bispiral in the middle and unispiral at the end.

TYPE LOCALITY: Hispaniola.

DISTRIBUTION: West Indies; also reported from Europe but the record doubtful.

ILLUSTRATIONS: Sagra, Hist. Cuba 9: *pl.* 19, *f.* 3; Atti Ist. Veneto 75: *pl.* 11, *f.* 3–11.

EXSICCATAE: Aust. Hep. Bor.-Am. 136c; Zahlbr. Krypt. 1689.

11. *Asterella echinella* (Gottsche) Underw. Bot. Gaz. 20: 62. 1895.

Fimbriaria echinella Gottsche, Danske Vid. Selsk. Skr. V. 6: 367. 1863.

Thallus green with more or less purple pigmentation especially along the margin and on the ventral surface, mostly 1–2 cm. long and 2–4 mm. wide, with a rounded keel and undulate margins scarcely, if at all, incurved when dry, the branching largely ventral, rarely dichotomous; epidermal cells averaging about $50 \times 25 \mu$, with slightly thickened walls but without trigones; cells containing oil-bodies few and scattered; pores slightly elevated, surrounded usually by 6–8 radiating series of cells with 3 cells in each series; green tissue compact, the dorsal air-chambers with crowded, vertical, supplementary partitions; compact ventral tissue composed of cells with more or less thickened walls containing pits; appendages of ventral scales one or two, narrowly subulate, mostly 0.6–0.9 mm. wide, acuminate, entire or nearly so. Autoicous; male receptacle terminal on a more or less elongate branch, sometimes with an apical innovation, oval to obcordate, fringed by narrow paleae; female receptacle borne on a short or more or less elongate branch, the stalk not pigmented, with scattered slender paleae and a denser apical cluster, mostly 1–1.5 mm. high, the disc hemispheric, mostly 2–3 mm. wide, covered with crowded, blunt tubercles 0.5–1 mm. long, normally 4-lobed, the lobes short but distinct; pseudoperianth white or somewhat tinged with purple, mostly 8–10-cleft, the segments connate at the tips, lanceolate; operculum remaining intact at dehiscence; spores pale-brown to dark-brown, mostly 60–100 μ in diameter with wings 8–10 μ wide; spore-surface minutely and irregularly punctulate and also covered with a coarse and usually regular reticulum, the meshes 15–20 μ wide; elaters pale-brown to dark-brown, mostly 12–14 μ wide, often unispiral throughout but sometimes bispiral in the middle.

TYPE LOCALITY: Orizaba, Veracruz.

DISTRIBUTION: Arkansas, Texas, and Mexico.

12. *Asterella reticulata* Evans, Contr. U. S.

Nat. Herb. 20: 302. 1920.

Thallus green above in the middle but more or less pigmented with purple below and along the margin, the green portion sometimes dotted or splotched with purple, mostly 1 cm. long and 2.5–5 mm. wide, with a rounded keel and undulate margins, somewhat incurved when dry, the branching largely ventral; epidermal cells averaging about $50 \times 25 \mu$, the walls somewhat thickened but without trigones; cells containing oil-bodies few and scattered; pores elevated, surrounded usually by 6–8 radiating series of cells with 3 or 4 cells in each series, the radial walls slightly thickened; green tissue compact, the dorsal chambers with crowded, vertical, supplementary partitions; compact ventral tissue composed of cells with more or

less thickened, pitted walls; appendages of ventral scales usually borne singly but sometimes in pairs, narrowly subulate or lanceolate, mostly 0.75–0.9 mm. long and 0.12–0.15 mm. wide, acuminate, entire or with a basal spine-like tooth. Probably autoicous; male receptacle terminal on a more or less elongate branch, oval, fringed by narrow paleae; female receptacle borne on a more or less elongate branch, the stalk purple, with scattered slender paleae and a denser apical cluster, mostly 1–1.5 cm. long, the disc purple, mostly 2.5–3 mm. wide, covered with low tubercles, normally 4-lobed, the lobes short but distinct; pseudoperianth brownish, not tinged with purple, mostly 8–10-cleft, the segments connate at the tips, lanceolate; operculum remaining intact at dehiscence; spores rather dark-brown, mostly 70–80 μ in diameter, with a thick wavy wing 3–4 μ wide; spore-surface covered with an irregular, rather coarse reticulum, the meshes mostly 8–12 μ wide, otherwise smooth or minutely punctulate; elaters pale-brown, mostly 12–14 μ wide, usually bispiral in the middle and unispiral at the ends, rarely unispiral throughout.

TYPE LOCALITY: Monte Verde, Yateras, Cuba.

DISTRIBUTION: Known only from the type locality.

13. *Asterella versicolor* Evans, Contr. U. S.
Nat. Herb. 20: 307. 1920.

Thallus green above in the middle but deeply pigmented with purple along the margin and below, mostly 0.5–1 cm. long and 1.5–3 mm. wide, with a rounded keel and slightly crispate margins, often more or less incurved when dry, the branching largely ventral, sometimes with apical innovations; epidermal cells averaging about $45 \times 30 \mu$, with slightly thickened walls and scarcely evident trigones; cells containing oil-bodies few and scattered, the ventral surface showing an irregular row of such cells near the margin; pores somewhat elevated, surrounded usually by 6 radiating series of cells with 2 or 3 cells in each series; radial walls slightly thickened; green tissue compact, the dorsal air-chambers with crowded, vertical, supplementary partitions; compact ventral tissue composed of cells with thickened, pitted walls; appendages of ventral scales borne singly or rarely in pairs, narrowly subulate, mostly 0.4–0.6 mm. long and 0.05–0.07 mm. wide, acuminate, entire. Autoicous; male receptacle terminal on a very short, expanded branch, irregular in form and without marginal paleae; female receptacle borne on a short or more or less elongate branch, the stalk purple with scattered slender paleae and a denser apical cluster, mostly 1.5–2 cm. long, the disc green to brownish, mostly 2–3 mm. wide, flattened-hemispheric, with crowded, short tubercles, normally 4-lobed, the lobes short but distinct; involucre white to purple, entire or nearly so; pseudoperianth white to purple, mostly 10–12-cleft, the segments connate at the tips, lanceolate; operculum remaining intact at dehiscence; spores purplish-black, becoming semi-opaque, mostly 110–120 μ in diameter, with paler, translucent, wavy wings 10–12 μ wide; entire spore-surface covered over with a fine and very irregular reticulum, the meshes mostly 2–8 μ in diameter, otherwise without markings; elaters purple, mostly 14–16 μ wide, sometimes unispiral throughout but usually bispiral in the middle.

TYPE LOCALITY: Sierra de San Estaban, near Guadalajara, Jalisco.

DISTRIBUTION: Central Mexico.

14. *Asterella lateralis* M. A. Howe, Bull. Torrey Club 25: 189. 1898.

? *Fimbriaria elegans Beyrichiana* G. L. N. Syn. Hep. 565. 1846.

? *Fimbriaria elegans obtusata* G. L. N. Syn. Hep. 565. 1846.

Fimbriaria quitensis Spruce, Trans. Bot. Soc. Edinb. 15: 563, as synonym. 1885.

Fimbriaria lateralis Stephani, Bull. Herb. Boiss. 7: 201. 1899.

Thallus green above in the middle, usually deeply pigmented along the margin and beneath, mostly 1–2 cm. long and 2–4 mm. wide, with a broad rounded keel and undulate margins, more or less incurved when dry, the branching rarely dichotomous, usually ventral; epidermal cells averaging about $55 \times 28 \mu$, with somewhat thickened walls but rarely with trigones; cells with oil-bodies few and scattered; pores elevated, surrounded usually by 8 radiating series of cells with 3 or 4 cells in each series, the radial walls slightly thickened; green tissue compact, the dorsal air-chambers with crowded, vertical, supplementary partitions; compact ventral tissue composed of thick-walled cells with pits; appendages of ventral scales one or

two, narrowly subulate or lanceolate, mostly 0.8–1 mm. long and 0.13–0.18 mm. wide, acuminate, entire or nearly so. Autoicous; male receptacle terminal on a very short, slightly expanded, ventral branch, irregular and vaguely defined, with occasional narrow paleae; female receptacle usually borne on a short, expanded and often obcordate ventral branch, rarely on a somewhat elongate branch, the stalk more or less purple, with narrow paleae above but naked below, mostly 1–2 cm. long, the disc hemispheric, mostly 2.5–3.5 mm. wide, covered with low tubercles, normally 4-lobed, the lobes short but distinct, extending obliquely downward; involucre entire or sinuate, sometimes slightly indented in the middle; pseudoperianth white or rarely purplish, mostly 8–10-cleft, the segments connate at the tips, lanceolate; operculum remaining intact at dehiscence; spores pale yellowish-brown to deep purplish-brown, mostly 90–120 μ in diameter, with wavy wings 10–12 μ wide; spore-surface minutely and densely punctulate, showing in addition, especially on the spheric face, a coarse and often irregular network, very rarely involving the wings, the meshes mostly 18–20 μ wide; elaters brown, mostly 12–14 μ wide, usually bispiral in the middle and unispiral at the ends.

TYPE LOCALITY: Colomas, Sinaloa.

DISTRIBUTION: Mexico; probably Costa Rica; also in Ecuador.

15. *Asterella Bolanderi* (Aust.) Underw. Bot. Gaz. 20: 61. 1895.

Fimbriaria Bolanderi Aust. Proc. Acad. Phila. 1869: 230. 1870.

Fimbriaria violacea Aust. Bull. Torrey Club 3: 17. 1872.

Asterella violacea Underw. Bot. Gaz. 20: 61. 1895.

Thallus green or yellowish-green in the middle above, more or less pigmented with purple along the margin and on the ventral surface, mostly 1–2 cm. long and 2–4 mm. wide, with a rounded keel and undulate margins, strongly incurved when dry, the branching rarely dichotomous, usually ventral; epidermal cells averaging about $40 \times 28 \mu$, somewhat thick-walled and sometimes with minute trigones; cells containing oil-bodies few and scattered; pores elevated, surrounded usually by 7 or 8 radiating series of cells with 3 cells in each series, the radial walls slightly thickened; green tissue compact, the dorsal air-chambers with crowded, vertical, supplementary partitions; compact ventral tissue composed of thick-walled cells with pits; appendages of ventral scales usually borne singly but sometimes in pairs, narrowly lanceolate or subulate, mostly 0.5–0.75 mm. long and 0.1–0.15 mm. wide, acuminate, entire or nearly so. Autoicous; male receptacle terminal on a very short, subclavate or slightly expanded, ventral branch, small and vaguely defined, without marginal paleae; female receptacle borne on a short and expanded, emarginate or obcordate, ventral branch, the stalk more or less purple, with scattered slender paleae and a denser apical cluster, mostly 1–3 cm. long, the disc hemispheric to bluntly subconoid, mostly 2.5–4 mm. wide, smooth or with very low tubercles, normally 4-lobed, the lobes short but distinct; pseudoperianth white or more or less pigmented with purple, mostly 12–16-cleft, the segments connate at the tips, lanceolate; operculum breaking into fragments at dehiscence; spores yellow to brown, mostly 65–100 μ in diameter, with wavy wings 8–12 μ wide; spore-surface minutely and irregularly punctulate and showing in addition a coarse and regular network involving the wings, the meshes mostly 12–20 μ wide; elaters yellow to brown, mostly 8–12 μ wide, sometimes bispiral throughout but usually unispiral at the ends.

TYPE LOCALITY: San Rafael, California.

DISTRIBUTION: California.

ILLUSTRATIONS: Mem. Torrey Club 7: pl. 97, 98.

EXSICCATAE: Aust. Hep. Bor.-Am. 136d; Underw. & Cook, Hep. Am. 158; C. F. Baker, Pacif. Slope Bryoph. 629.

DOUBTFUL SPECIES

(For a discussion of the status of these species, and the reasons why their identity is uncertain, see Evans, Contr. U. S. Nat. Herb. 20: 309–312. 1920.)

FIMBRIARIA ARSENI Stephani, Sp. Hep. 6: 11. 1917.

FIMBRIARIA ATRISPORA Stephani, Bull. Herb. Boiss. 7: 93. 1899.

FIMBRIARIA MEXICANA Stephani, Sp. Hep. 6: 15. 1917.

FIMBRIARIA PRINGLEI Stephani, Rev. Bryol. 36: 139. 1909. Not *F. Pringlei* Stephani, 1899.

FIMBRIARIA STAHLII Stephani, Bull. Herb. Boiss. 7: 201. 1899.

Family 6. MARCHANTIACEAE

BY ALEXANDER WILLIAM EVANS

Plants scattered or in depressed mats, perennial. Thallus medium-sized to large (mostly 1–10 cm. in length), normally repeatedly dichotomous but sometimes with ventral branches, the upper surface usually divided into distinct, polygonal areas by the boundaries of the air-chambers. Epidermis usually distinct, with simple or compound pores; air-chambers (when present) in one or apparently several layers, with or without green filaments; ventral scales in two or more rows, membranous, bearing slime-papillae and some or all with appendages. Dioicous or rarely monoicous. Antheridia borne on stalked or sessile receptacles, arising terminally on thallus-branches and representing specialized branches or branch-systems; archegonia at first superficial, borne singly or in groups on stalked receptacles representing specialized branch-systems, soon appearing ventral in position through the active intercalary growth of the receptacles; epidermal pores (when present) compound; involucre membranous (at least in part), tubular or bilabiate; pseudoperianths sometimes present, campanulate with a narrow tubular mouth, ruptured irregularly at maturity. Sporophyte consisting of a capsule, a seta, and a foot. Capsule subspheric to short-cylindric, containing both spores and elaters, the wall one cell thick except in the apical region, the cells usually with annular thickenings; seta and foot relatively short. Gemmae when present discoid, clustered, produced in membranous, cup-shaped or crescentic cupules, on the dorsal surface of the thallus.

Thallus with air-chambers and epidermal pores, pale-green or more or less pigmented with purple, the upper surface divided into polygonal areas.

Epidermal pores of thallus simple; air chambers in a single layer with vertical green filaments; male receptacle sessile; pseudoperianth lacking.

Receptacles without epidermal pores; stalk of female receptacle without a rhizoid-furrow; cupules present, crescentic.

Receptacles with epidermal pores; stalk of female receptacle with a single rhizoid-furrow; cupules lacking.

Epidermal pores of thallus compound; receptacles stalked and provided with epidermal pores, the stalks with two (or more) rhizoid-furrows; pseudoperianth present.

Air-chambers apparently in several layers, destitute of green filaments.

Air-chambers in a single layer, with vertical green filaments.

Apical innovations present; cupules lacking.

Apical innovations lacking; cupules present, cup-shaped.

Thallus (at least at maturity) without air-chambers or epidermal pores, dark-green, the upper surface not divided into polygonal areas; receptacles stalked, without epidermal pores, the stalks with two rhizoid-furrows; pseudoperianth and cupules lacking.

1. LUNULARIA.

2. CONOCEPHALUM.

4. BUCEGIA.

5. PREISSIA.

6. MARCHANTIA.

3. DUMORTIERA.

1. LUNULARIA (Micheli) Adans. Fam. Pl. 2: 15. 1763.

Staurophora Willd. Ges. Nat. Freunde Berlin Mag. 3: 101. 1809.

Dichominum Neck (Elem. 3: 345, hyponym. 1790); Trevisan, Rend. Ist. Lomb. II. 7: 785. 1874, .

Thallus dichotomous and also with apical innovations, green or yellowish, not pigmented with purple. Epidermis colorless or nearly so, composed of a single layer of cells, none containing oil-bodies; pores simple, elevated, each surrounded by 6 or more radiating series of cells with 4 or 5 cells in each series; air-chambers in a single layer, the floors giving rise to crowded, short, simple or branched green filaments composed of rounded to cylindric cells; ventral tissue composed of colorless parenchyma without slime-cells or sclerotic cells but with scattered

cells containing oil-bodies; ventral scales appendiculate, in 2 longitudinal rows. Dioicous. Receptacles without pores. Male receptacles sessile, terminal on a short branch, consisting of an oval, elevated disc flattened above and with a broad wavy margin, not lobed, the antheridia arising in acropetal succession in a broad median area. Female receptacle stalked, the stalk colorless, without a rhizoid-furrow, the base surrounded by a cluster of crowded ovate scales; disc with 4 short radiating rows of archegonia, each row giving rise normally to a single sporophyte; involucre membranous, tubular, with a wide mouth; pseudoperianth lacking. Capsule oval, the wall composed of a single layer of cells except in a small apical area, the cells without thickenings in their walls; dehiscence by means of 4-8 irregular splits, extending from the apex, the thickened apical portion remaining intact. Spores yellowish-green, tetrahedral, smooth; elaters very long and slender, bispiral. Gemmae discoid with 2 opposite apical cells, attached vertically by short stalks, borne in crescentic cupules with entire margins.

Type species, *Marchantia cruciata* L.

1. *Lunularia cruciata* (L.) Dumort. Comm. Bot. 116. 1822.

Marchantia cruciata L. Sp. Pl. 1137. 1753.

Staurophora pulchella Willd. Ges. Nat. Freunde Berlin Mag. 3: 101. 1809.

Lunularia vulgaris Raddi, Opusc. Sci. Bologna 2: 355. 1818.

Sedgwickia hemisphaerica Bowdich, Excurs. Madeira 35. 1825.

Preissia cucullata Mont. & Nees; Mont. Ann. Sci. Nat. II. 9: 44. 1838.

Lunularia Michellii Le Jolis, Mém. Soc. Sci. Nat. Cherbourg 1: 192. 1853.

Lunularia Dillenii Le Jolis, Mém. Soc. Sci. Nat. Cherbourg 1: 192. 1853.

Dichominum cruciatum Trevisan, Rend. Ist. Lomb. II. 7: 785. 1874.

Dichominum vulgare Trevisan, Mem. Ist. Lomb. 13: 436. 1877.

Cyathophora cucullata Kuntze, Rev. Gen. 834. 1891.

Marsilia cruciata Kuntze, Rev. Gen. 837. 1891.

Thallus brittle, sometimes thin and delicate, sometimes thick, mostly 2-3 cm. long and about 1 cm. wide, the thin margin often somewhat crispate; epidermal cells averaging about $25 \times 15 \mu$, their walls slightly to strongly thickened, sometimes with distinct trigones; cells of ventral tissue with more or less distinct pits; appendages of ventral scales scarcely or not at all pigmented, orbicular to reniform, about 0.5 mm. long, the margin entire to vaguely crenulate. Male receptacle mostly 0.2-0.4 cm. long; female receptacle borne on a colorless stalk 1.5-3 cm. long, the scales at the base dentate to fimbriate; disc about 0.2 cm. wide, with involucres about 0.2 cm. long; spores yellowish-green, tetrahedral, smooth, $15-20 \mu$ in diameter; elaters mostly $5-8 \mu$ wide.

TYPE LOCALITY: Europe.

DISTRIBUTION: New England to Michigan; Washington to California; Bermuda and Jamaica; introduced and largely confined to greenhouses; also in Europe, Africa, Asia, South America, and Australia.

ILLUSTRATIONS: Micheli, Nov. Pl. Gen. pl. 4; Dill. Hist. Musc. pl. 75, f. 5; Pearson, Hep. Brit. Isles pl. 212; Rab. Krypt.-Fl. 6: f. 174-178; Atti Ist. Veneto 75: pl. 7.

EXSICCATAE: Aust. Hep. Bor.-Am. 126; Underw. & Cook. Hep. Am. 64.

2. *CONOCEPHALUM** Weber; Wiggers, Prim. Fl. Holsat. 82. 1780.

Fegatella Raddi, Opusc. Sci. Bologna 2: 356. 1818.

Thallus dichotomous, the branches often appearing as spiral innovations, green or somewhat pigmented with purple. Epidermis colorless or nearly so, composed of a single layer of cells or locally of two layers, without trigones, some of them containing oil-bodies; pores simple, elevated, each surrounded by 5-8 radiating series of cells with 5 or 6 cells in each series; air-chambers in a single layer, their boundaries distinctly visible through the epidermis, the floors giving rise to crowded simple or branched green filaments composed of rounded cells with narrow bases, the filaments in the vicinity of the pores terminating in slender colorless processes; ventral tissue composed of colorless parenchyma with pitted walls, some of the cells containing oil-bodies and some specialized as slime-cells or forming slime-sacs; sclerotic cells lacking; ventral scales appendiculate, in two longitudinal rows. Dioicous; receptacles with compound pores; male receptacle sessile, terminal on a short branch, consisting of an elevated oval or circular disc, not lobed, the antheridia arising acropetally from the center in

*Later authors commonly use *Conocephalus*, here regarded as a variant spelling.

6-8 indefinite rows. Female receptacle terminal on a short branch, stalked, the stalk at first short, rapidly elongating at maturity, with a single rhizoid-furrow, destitute of green tissue, the disk strongly conic, very shortly lobed, the lobes mostly 6-8, each usually bearing a single archegonium; involucre membranous, undivided, with a narrow apical opening; pseudoperianth lacking. Capsule ellipsoidal, the wall composed of a single layer of cells except in a small apical area, the cells with annular thickenings; dehiscence by means of irregular splits extending from the apex, the thickened apical portion remaining intact. Spores at first tetrahedral but soon becoming ellipsoid, the outer wall densely covered with minute verruculae; elaters relatively short, with two or more spirals. Vegetative reproduction by means of apical or ventral tubers or minute deciduous branches; gemmae lacking.

Type species, *Conocephalum trioicum* Weber.

1. *Conocephalum conicum* (L.) Dumort. Comm. Bot. 115. 1822.

Marchantia conica L. Sp. Pl. 1138. 1753.

Conocephalum trioicum Weber; Wiggers, Prim. Fl. Holsat. 82. 1780.

Fegatella officinalis Raddi, Opusc. Sci. Bologna 2: 356. 1818.

Strozzia conica S. F. Gray, Nat. Arr. Brit. Pl. 1: 682. 1821.

Fegatella conica Corda, in Opiz, Beitr. 649. 1829.

Conocephalum nemorosum Hüben. Hep. Germ. 9. 1834.

Conocephalum vulgare Bisch. Nova Acta Acad. Leop.-Carol. 17: 979. 1835.

Conocephalum officinale Trevisan, Rend. Ist. Lomb. II. 7: 785. 1874.

Hepatica conica Lindb. Hep. Utveckl. 16. 1877.

Fegatella japonica Stephani, Hedwigia 22: 50. 1883.

Asterella Kiaerii Kaalaas, Nyt Mag. Naturvid. 33: 78. 1893.

Conocephalum japonicum Schiffn. in E. & P. Nat. Pfl. 13: 35. 1893.

Thallus pale-green to dark-green, thin but firm, the ventral surface often purplish, mostly 10-20 cm. long and 1-2 cm. wide, the upper surface divided into distinct polygonal areas, representing the air-spaces, each with a central pore; epidermal cells averaging about $50 \times 30 \mu$, those surrounding the pore strongly outwardly curved; colorless processes in the vicinity of the pores long and slender; ventral tissue composed of cells with conspicuous pits, the slime-sacs few but large; appendages of ventral scales orbicular to reniform, mostly 0.3-0.5 mm. long, entire, the marginal cells forming a more or less distinct border. Male receptacle about 0.5 cm. wide; female receptacle borne on a stalk 5-10 cm. long, the disc about 0.5 cm. high; spores green, ellipsoidal, multicellular, mostly 70-100 μ in diameter; elaters irregular sometimes branched, mostly 12-20 μ wide. Tubers ventral, rarely produced, spheric, greenish or brownish, composed of parenchyma and covered with rhizoids.

TYPE LOCALITY: Europe.

DISTRIBUTION: Newfoundland to Alaska, southward to Georgia, New Mexico, and Arizona; also in Europe, the Atlantic Islands and Asia; on damp banks and rocks, especially along streams.

ILLUSTRATIONS: Micheli, Nov. Pl. Gen. pl. 2, f. 1; Dill. Hist. Musc. pl. 75, f. 1; Pearson, Hep. Brit. Isles pl. 209; Ann. Bot. 18: pl. 6, 7; Beih. Bot. Centralbl. 18: pl. 12, 13 and f. 1-16; Rab. Krypt-Fl. 6: f. 170-173; Atti Ist. Veneto 75: pl. 6.

EXSICCATAE: Aust. Hep. Bor-Am. 131; Underw. & Cook, Hep. Am. 3; Macoun, Can. Hep. 74.

3. *DUMORTIERA* Nees, Nova Acta Acad. Leop.-Carol.

12: 410. 1824.

Hygropyla Tayl.; Mackay, Fl. Hib. 2: 54. 1836.

Askepos Griff. Not. Pl. Asiat. 2: 340. 1849.

Thallus dark-green to yellowish-green, not pigmented with purple, dichotomous and also with ventral branches, the upper surface lacking epidermis and air-chambers, but sometimes showing vestiges of them; ventral tissue composed of parenchyma, the cells of the lower part of the keel long and narrow, an occasional cell with oil-bodies present; ventral scales in two longitudinal rows, hyaline and rudimentary, without distinct appendages. Dioicous or monoicous. Receptacles without pores, stalked, the stalks with two rhizoid-furrows, destitute of green tissue, that of the male receptacle very short. Male receptacle terminal, oval to circular, flattened above, not lobed, the lower surface with more or less numerous stiff bristles forming a peripheral fringe, the antheridia arising acropetally from the center but not forming distinct rows. Female receptacle flattened and often bristly above, shortly lobed, the lobes mostly 6-10, subequally disposed, each bearing a row of archegonia but usually developing only one sporophyte; involucre rather thick, hyaline, undivided, with a short apical split,

bearing scattered bristles. Pseudoperianth lacking. Capsule oval, the wall composed of a single layer of cells except in a small apical area, the cells with annular thickenings; dehiscence by means of irregular splits, mostly 4–8, extending from the apex, the thickened apical portion remaining intact. Spores small, indistinctly tetrahedral, without surface-folds or lamellae but minutely tuberculate; elaters long and slender, bispiral. Gemmae lacking.

Type species, *Marchantia hirsuta* Sw.

Upper surface of thallus with few or no papilliform outgrowths, often smooth and glossy in appearance; boundaries of air-chambers sometimes absent altogether, sometimes distinct.

Upper surface of thallus covered with papilliform outgrowths, velvety in appearance; boundaries of the vestigial air-chambers distinct.

1. *D. hirsuta*.

2. *D. nepalensis*.

1. *Dumortiera hirsuta* (Sw.) Nees, Nova Acta

Acad. Leop.-Carol. 12: 410. 1824.

Marchantia hirsuta Sw. Prodr. 145. 1788.

Marchantia irrigua Wilson; Hook. Brit. Fl. 2: 106. 1833.

Hygropyla irrigua Tayl.; Mackay, Fl. Hibern. 2: 54. 1836.

Dumortiera irrigua Nees, Naturg. Eur. Leberm. 4: 159. 1838.

Dumortiera hirsuta angustior G. L. N. Syn. Hep. 544. 1846.

Dumortiera hirsuta intermedia G. L. N. Syn. Hep. 544. 1846.

Askepos brevipes Griff. Not. Pl. Asiat. 2: 340. 1849.

Dumortiera hirsuta irrigua Spruce, Trans. Bot. Soc. Edinb. 15: 566. 1885.

Thallus mostly 10–20 cm. long and 1–2 cm. wide, smooth or nearly so, the boundaries of the evanescent air-chambers sometimes indicated by delicate anastomosing lines on the upper surface; green tissue forming a smooth superficial layer of small cells; ventral tissue sometimes thin-walled throughout, sometimes with more or less distinct pits, sometimes with collenchymatous thickenings, the cells containing starchgrains except in the small-celled keel. Usually dioicous but sometimes monoicous and rarely with bisexual receptacles; male receptacle about 0.5 cm. broad, the upper surface smooth or with a few bristles; female receptacle borne on a stalk 4–6 cm. long, the disc mostly 0.9–0.8 mm. wide, usually with marginal bristles only; spores reddish-brown, mostly 25–35 μ in diameter; elaters 6–8 μ wide.

TYPE LOCALITY: Jamaica.

DISTRIBUTION: Pennsylvania to Florida and Alabama; Arkansas; Mexico and Central America; Bermuda and the West Indies; also in South America, Europe, Africa, Asia, and the Pacific Islands; on wet rocks and banks.

ILLUSTRATIONS: Pearson, Hep. Brit. Isles 2: pl. 213; Atti Ist. Veneto 75: pl. 5.

EXSICCATAE: Sull. Musci Allegh. 288; Gottsche & Rab. Hep. Eur. 562; Aust. Hep. Bor.-Am. 130; Underw. & Cook, Hep. Am. 120.

2. *Dumortiera nepalensis* (Tayl.) Nees, Naturg.

Eur. Leberm. 4: 169. 1838.

Hygropyla nepalensis Tayl. Trans. Linn. Soc. 17: 392. 1836.

Marchantia trichocephala Hook. Ic. Pl. pl. 158. 1837.

Dumortiera trichocephala Nees, Naturg. Eur. Leberm. 4: 499. 1838.

Dumortiera hirsuta latior G. L. N. Syn. Hep. 544. 1846.

? *Askepos brevipes* Griff. Not. Pl. Asiat. 2: 340, in part. 1849.

Dumortiera hirsuta trichopus Spruce, Trans. Bot. Soc. Edinb. 15: 567. 1885.

Dumortiera velutina Schiffn. Denks. Acad. Wien 67: 156. 1898.

Dumortiera calcicola Campb. Ann. Bot. 32: 334. 1918.

Closely related to the preceding species but usually easily distinguished by its velvety appearance, produced by crowded papilliform outgrowths on the upper surface. Upper surface of female receptacle usually with scattered bristles, even in the middle portion.

TYPE LOCALITY: Nepal.

DISTRIBUTION: Florida; Mexico; Honduras; Jamaica; Porto Rico; also in South America, eastern Asia, and the Pacific Islands; on wet rocks and banks.

ILLUSTRATIONS: Trans. Linn. Soc. 17: pl. 15, f. 2; Hook. Ic. Pl. pl. 158.

4. *BUCEGIA* Radian, Bull. Herb. Inst. Bot.

Bucarest 3–4: 1. 1903.

Thallus dichotomous and also with apical innovations, more or less pigmented with purple. Epidermis composed of a single layer of thin-walled cells without trigones; oil-bodies lacking; pores compound, the opening surrounded by 4 or 5 superimposed circles of cells; air-chambers

apparently in two or more layers, without green filaments, separated by green partitions one cell thick; ventral tissue composed of parenchyma without sclerotic cells, slime-cells, or cells containing oil-bodies; ventral scales lunulate, appendiculate, in two longitudinal rows. Dioicous. Receptacles with compound pores, stalked, the stalks with 2 (sometimes 3 or 4) rhizoid-furrows, destitute of green tissue. Male receptacle flattened above, not definitely lobed, the antheridia arising acropetally in radiating rows. Female receptacle convex above, slightly lobed, the lobes mostly 4, each bearing a group of archegonia tending to be tangentially arranged, the group enclosed on the inside by an undivided, membranous involucre with crenulate margin. Pseudoperianth enclosing a single sporophyte, campanulate, abruptly contracted to a narrow tubular mouth. Capsule subspheric, the wall composed of a single layer of cells, except in a small apical area, the cells with half-annular, sometimes coalescent, thickenings; dehiscence by means of irregular splits, mostly 4, beginning at the apex, the thickened apical portion remaining intact and attached to one of the lobes. Spores tetrahedral, with narrow marginal folds and surface-lamellae; elaters long and slender, with 2 or 3 spirals. Gemmae lacking.

Type species, *Bucegia romanica* Radian.

1. *Bucegia romanica* Radian, Bull. Herb. Inst.
Bot. Bucarest 3-4: 2. 1903.

Thallus usually green with the ventral surface and margins purplish, sometimes pigmented throughout, mostly 2-3 cm. long and 0.5-1 cm. wide, the ventral keel sharp; epidermal pores with a cruciate inner opening; appendages of ventral scales lanceolate, acuminate, the margin varying from subentire to sparingly and irregularly denticulate, or dentate. Male receptacle terminal or dorsal in position, borne on a stalk 0.5-1 cm. long, with two, closely approximated rhizoid-furrows, the disc mostly 0.2-0.3 cm. wide; female receptacle borne on a stalk 1-2 cm. long, the disc about 0.5 cm. wide; spores reddish-brown, 45-50 μ in diameter, the surface-lamellae sometimes forming an indistinct reticulum; elaters about 8 μ wide.

TYPE LOCALITY: Rumania.

DISTRIBUTION: Alberta and British Columbia; also in Europe (Rumania, Poland, and Hungary); on calcareous rocks at high altitudes.

ILLUSTRATIONS: Rab. Krypt.-Fl. 6: f. 180, 181; Beih. Bot. Centralbl. 23: f. 1-24; Bryologist 18: f. 1, A, B; Atti Ist. Veneto 75: pl. 4.

5. *PREISSIA* Corda, in Opiz, Beitr. 647. 1829.

Cyathophora S. F. Gray, Nat. Arr. Brit. Pl. 1: 683. 1821. Not *Cyathophorum* Beauv. 1805.
Chomiocarpon Corda, in Opiz, Beitr. 647. 1829.

Thallus at first dichotomous, afterwards bearing numerous apical innovations, more or less pigmented with purple. Epidermis with a few chloroplasts, one cell thick, the cells thin-walled and without trigones, oil-bodies, slime-cells and surface-papillae lacking; pores compound, the opening surrounded by four or five superimposed circles of cells; air-chambers in a single layer, the floor giving rise to crowded, simple or branched green filaments composed of rounded cells; ventral tissue composed of parenchyma with scattered sclerotic cells; ventral scales lunulate, appendiculate, in two longitudinal rows. Dioicous or autoicous. Receptacles with compound pores, stalked, the stalks with 2 (rarely 4) rhizoid-furrows, destitute of green tissue. Male receptacle convex above with a thin membranous margin, scarcely or not at all lobed, bearing 3-6, usually 4, radiating series of antheridia in acropetal succession. Female receptacle slightly lobed, the lobes mostly 4, each bearing a group of archegonia tending to be arranged tangentially, the rays of the *Marchantia* receptacle represented by 4 ridges on the upper surface, alternating with the lobes, each group of archegonia enclosed (on the inside) by an undivided, membranous involucre with subentire margin. Pseudoperianth enclosing a single sporophyte, membranous, campanulate, abruptly contracted at first to a narrow tubular mouth. Capsule subspheric, the wall composed of a single layer of cells except in a small apical area, the cells with annular thickenings; dehiscence by means of irregular splits beginning at the apex, the thickened apical portion not remaining intact. Spores tetrahedral, with narrow marginal folds and surface-lamellae; elaters long and slender, bispiral or trispiral. Gemmae lacking.

Type species, *Preissia italica* Corda.

1. *Preissia quadrata* (Scop.) Nees, *Naturg. Eur. Leberm.* 4: 135. 1838.

- Marchantia hemisphaerica* L. *Fl. Suec.* ed. 2. 405. 1755. Not *M. hemisphaerica* L. 1753.
Marchantia quadrata Scop. *Fl. Carn.* ed 2. 355. 1772.
Marchantia triandra Weber, *Spic. Fl. Goetting.* 163. 1778. Not *M. triandra* Scop. 1772.
Marchantia androgyna Weber, *Spic. Fl. Goetting.* 168. 1778. Not *M. androgyna* L. 1753.
Marchantia triloba Schrank, *Baier. Fl.* 2: 502. 1789.
Reboulia quadrata Bertol. *Amoen. Ital.* 440. 1819.
Cyathophora angustifolia S. F. Gray, *Nat. Arr. Brit. Pl.* 1: 683. 1821.
Conocephalum hemisphaericum Dumort. *Comm. Bot.* 115. 1822.
Preissia italica Corda, in Opiz, *Beitr.* 647. 1829.
Marchantia commutata Lindenb. *Nova Acta Acad. Leop.-Carol.* 14: Suppl. 101. 1829.
Conocephalum quadratum Hüben. *Hep. Germ.* 11. 1834.
Preissia commutata Nees, *Naturg. Eur. Leberm.* 4: 117. 1838.
Preissia hemispherica Cogn. *Bull. Soc. Bot. Belg.* 10: 296. 1872.
Cyathophora commutata Trevisan, *Mem. Ist. Lomb.* 13: 438. 1877.
Cyathophora quadrata Trevisan, *Mem. Ist. Lomb.* 13: 438. 1877.
Chomiocarpus quadratus Lindb. *Hep. Utveckl.* 6. 1877.
Chomiocarpus quadratus commutatus Lindb. *Acta Soc. Faun. Fl. Fenn.* 2³: 4. 1882.
Cyathophora hemisphaerica Kuntze, *Rev. Gen.* 834. 1891.
Chomiocarpus commutatus Lindb.; C. Jensen, *Rev. Bryol.* 20: 66. 1893.

Thallus usually pale-green with the ventral surface and margins purplish, sometimes pigmented throughout, mostly 2–3 cm. long and 0.5–1 cm. wide; epidermal cells averaging about $38 \times 28 \mu$; pores usually bounded by 4 or 5 superimposed circles of cells with 4 cells in each circle or in part with 5 or 5 cells, those of the innermost circle enclosing a cruciate opening; sclerotic cells of ventral tissue usually conspicuous but sometimes scanty or lacking in delicate forms; mycorrhiza often forming two distinct longitudinal strands; appendages of ventral scales lanceolate to narrowly ovate-lanceolate, mostly 0.3–0.45 mm. long and 0.15–0.3 mm. wide, acuminate, subentire to coarsely and sparingly dentate. Dioicous or autoicous; receptacles often pigmented with purple; male receptacle borne on a stalk 1–2 cm. long, the disc mostly 0.2–0.3 cm. wide; female receptacle borne on a stalk 5–10 cm. long, the disc about 0.5 cm. wide; spores brown, mostly 55–70 μ in diameter, tetrahedral, with narrow marginal folds and low surface-lamellae, crowded but scarcely forming a reticulum; elaters about 8 μ wide.

TYPE LOCALITY: Europe.

DISTRIBUTION: Arctic America, Canada, and the northern United States as far south as Virginia and Colorado; also in Europe and Asia; on banks and rocks, preferably calcareous.

ILLUSTRATIONS: Scop. *Fl. Carn.* ed. 2. *pl.* 63; Sturm, *Deuts. Fl. Jungerm.* *pl.* 18; *Nova Acta Acad. Leop.-Carol.* 17²: *pl.* 59, *f.* 1, 5¹; Pearson, *Hep. Brit. Isles* 2: *pl.* 211; Rab. *Krypt.-Fl.* 6: *f.* 182–184; Atti *Ist. Veneto* 75: *pl.* 3.

EXSICCATAE: Aust. *Hep. Bor.-Am.* 129; Underw. & Cook, *Hep. Am.* 22, 167; Macoun, *Can. Hep.* 78.

6. *MARCHANTIA* (Marchant f.) L. *Sp. Pl.* 1137. 1753.

Chlamidium Corda, in Opiz, *Beitr.* 647. 1829.

Thallus dichotomous, without ventral branches, flat, often more or less pigmented with purple. Epidermis usually colorless but sometimes with chloroplasts, one cell thick throughout or locally two cells thick, the cells without trigones; cells containing oil-bodies or slime and surface-papillae sometimes present; pores compound, the opening usually surrounded by 4–7 superimposed circles of cells; air-chambers in a single layer, the floor giving rise to crowded, simple or branched, green filaments, composed of rounded cells with narrow bases; ventral tissue composed of parenchyma with more or less pitted walls, sometimes with scattered sclerotic cells, more rarely with slime-cells; ventral scales in 4 or more longitudinal rows, the median scales lunulate and appendiculate, the remaining scales narrower and without appendages. Dioicous. Receptacles with compound pores, stalked, the stalks with 2 (–4) rhizoid-furrows and, except sometimes in the case of the male receptacle, with one or two longitudinal bands of green tissue with air-chambers and pores. Male receptacle flattened above, more or less distinctly lobed, the lobes mostly 4–8, each bearing on its upper surface an acropetal series of antheridia. Female receptacle more or less distinctly rayed, the rays (representing the middle- and side-lobes of a branch-system) mostly 5–9, the archegonia borne in acropetal groups alternating with the rays, each group enclosed by a bipartite, membranous involucre, often with toothed or lacinate margins. Pseudoperianth enclosing

a single sporophyte, membranous, campanulate, abruptly contracted at first to a narrow tubular mouth. Capsule subspheric, the wall composed of a single layer of cells except in a small apical area, the cells with annular thickenings; dehiscence by means of irregular splits beginning at the apex, the thickened apical portion not remaining intact. Spores tetrahedral with narrow borders and surface-lamellae or spheric and smooth; elaters long and slender, bispiral. Gemmae discoid with 2 opposite apical cells, attached vertically by short stalks, borne in cup-shaped cupules with dentate or laciniate margins.

Type species, *Marchantia polymorpha* L.

Thallus destitute of sclerotic cells; rays of female receptacle terete; cupules with surface-papillae. (ASTROMARCHANTIA.)

Thallus with sclerotic cells; rays of female receptacle flat to convex; cupules destitute of surface-papillae. (CHLAMIDIUM.)

Stalk of female receptacle with a single band of green tissue.

Epidermal pores cruciate.

Epidermal pores not cruciate.

Appendages of ventral scales sparingly crenulate or denticulate; rays of female receptacle short and broad.

Appendages of ventral scales closely denticulate or ciliolate; rays of female receptacle long and usually narrow.

Stalk of female receptacle with two bands of green tissue.

1. *M. polymorpha*.

2. *M. paleacea*.

3. *M. breviloba*.

4. *M. domingensis*.

5. *M. chenopoda*.

1. *Marchantia polymorpha* L. Sp. Pl. 1137. 1753.

Marchantia stellata Scop. Fl. Carn. ed. 2. 353. 1772.

Marchantia umbellata Scop. Fl. Carn. ed. 2. 354. 1772.

Marchantia polymorpha domestica Wahlenb. Fl. Lapp. 397. 1812.

Marchantia latifolia S. F. Gray, Nat. Arr. Brit. Pl. 1: 682. 1821.

Marchantia minor S. F. Gray, Nat. Arr. Brit. Pl. 1: 682. 1821.

Marchantia macrocephala Corda; Sturm, Deuts. Fl. Jungerm. 63. 1832.

Marchantia vittata Raddi, Mem. Soc. Ital. Modena 20: 45. 1829.

Marchantia polymorpha communis Nees, Naturg. Eur. Leberm. 4: 65. 1838.

Marchantia polymorpha alpestris Nees, Naturg. Eur. Leberm. 4: 70. 1838.

Marchantia Syckorae Corda; Nees, Naturg. Eur. Leberm. 4: 97. 1838.

Marchantia oregonensis Stephani; Röhl, Bot. Centr. 45: 203. 1891.

Marchantia polymorpha mamillata Hagen; Schiffn. Lotos 49: 93. 1901.

Thallus pale-green to dark-green, sometimes with a brownish median band, often purplish beneath, mostly 4–6 cm. long and about 1 cm. wide, texture delicate or firm but never leathery; epidermal cells averaging about $29 \times 16 \mu$; surface-papillae sometimes present near margin of thallus; pores usually bounded by 4 circles of cells with 4 cells in each circle, those of the innermost circle with rounded papillae sometimes almost closing the opening; ventral tissue destitute of sclerotic cells and slime-cells; ventral scales in 6 more or less distinct rows, the marginal scales usually projecting; appendages of median scales broadly orbicular, mostly 0.5–0.75 mm. long and 0.6–0.8 mm. wide, rounded to very bluntly pointed, the margin minutely and irregularly denticulate or crenulate. Male receptacle borne on a stalk 1–3 cm. long with 2 rhizoid-furrows, destitute of green tissue, mostly 0.7–1 cm. broad, shortly lobed or merely crenate, the lobes mostly 8, subsymmetrically spaced; female receptacle borne on a stalk 2–7 cm. long, with two rhizoid-furrows and a single broad band of green tissue, mostly 0.8–1.3 cm. wide, deeply rayed, the rays mostly 9, 3–5 mm. long, separated by subequal sinuses, terete, with numerous surface-papillae; involucre deeply and irregularly lobed, the lobes long-acuminate and with ciliate margins; spores yellow, 12–15 μ in diameter, nearly smooth; elaters 3–5 μ wide. Cupules deeply lobed, the lobes acute to acuminate, dentate to short-spinose, the outer surface with papillae.

TYPE LOCALITY: Europe.

DISTRIBUTION: Greenland to Alaska, and southward throughout Canada and the United States; Mexico, Central America, Bermuda, and the West Indies; also in Europe, Asia, South America, and various antarctic islands; on banks and earth in woods, fields, and gardens; also in swamps and bogs; sometimes apparently introduced.

ILLUSTRATIONS: Micheli, Nov. Pl. Gen. pl. 1, f. 1–3, 5, 6; Dill. Hist. Musc. pl. 76, 77, f. 7; Nouv. Ann. Mus. 1: pl. 5–7; Sturm, Deuts. Fl. Jungerm. pl. 17; Kny, Bot. Wandtaf. pl. 84–90; Pearson, Hep. Brit. Isles pl. 208; Rab. Krypt.-Fl. 6: f. 185–187; Atti Ist. Veneto 75: pl. 1; Trans. Conn. Acad. 21: f. 1, 2.

EXSICCATAE: Sull. Musci Allegh. 286; Aust. Hep. Bor.-Am. 127; Underw. & Cook, Hep. Am. 2; Macoun, Can. Hep. 71; Haynes, Am. Hep. 117.

2. *Marchantia paleacea* Bertol. Opusc. Sci.
Bologna 1: 242. 1817.

Marchantia papillata italica Raddi, Mem. Soc. Ital. Modena 19: 44. 1823.

Fimbriaria paleacea Corda, in Opiz, Beitr. 648. 1829.

Marchantia nepalensis Lehm. & Lindenb.; Lehm. Stirp. Pug. 4: 10. 1832.

Marchantia nitida Lehm & Lindenb.; Lehm. Stirp. Pug. 4: 11. 1832.

Marchantia squamosa Raddi; Lehm. Stirp. Pug. 4: 12, in part. 1832.

Marchantia tholophora Bisch. Nova Acta Acad. Leop.-Carol. 17: 989. 1835.

Marchantia calcarata Stephani, Bull. Herb. Boiss. 5: 98. 1897.

Marchantia planipora Stephani, Bull. Herb. Boiss. 5: 98. 1897.

Thallus pale-green, often glaucous and sometimes purplish beneath and along the margin, mostly 2–4 cm. long and 0.5–0.8 cm. wide, the texture firm but scarcely leathery; epidermal cells averaging about $43 \times 30 \mu$; surface-papillae lacking; pores usually bounded by 6 circles of cells with 4 cells in each circle, those of the innermost circle enclosing a cruciate opening; ventral tissue with sclerotic cells and sometimes with slime-cells; ventral scales in four rows; appendages of median scales oblong to ovate-orbicular, mostly 0.6–0.75 mm. long and 0.45–0.6 mm. wide, rounded to acute at the apex and entire to vaguely dentate on the margin. Male receptacle borne on a stalk 5–7 mm. long, with 2 rhizoid-furrows, destitute of green tissue, mostly 5–6 mm. broad, shortly lobed, the lobes mostly 8, subsymmetrically spaced; female receptacle borne on a stalk 2–4 cm. long, with 2 rhizoid-furrows and a single broad band of green tissue, mostly 0.5 cm. wide, deeply rayed, the rays mostly 9, separated by sub-equal sinuses or with one sinus broader than the others, dilated at the truncate or emarginate apex, flat, without papillae; involucre deeply and irregularly lobed, the lobes long-acuminate and with ciliate margins; spores brownish-yellow, about 34μ in diameter, tetrahedral, with narrow wings and low surface-lamellae; elaters 6–8 μ wide. Cupules deeply lobed, the lobes acute to acuminate, dentate to short-spinose, destitute of papillae.

TYPE LOCALITY: Italy.

DISTRIBUTION: Texas and Arizona to Guatemala; Cuba and Jamaica; also in Europe, Africa, and Asia; on banks and rocks.

ILLUSTRATIONS: Micheli, Nov. Pl. Gen. pl. 1, f. 4; Bisch. Handb. Bot. Term. 2: pl. 55, f. 2727; Rab. Krypt.-Fl. 6: f. 188, 189; Atti Ist. Veneto 75: pl. 2; Trans. Conn. Acad. 21: f. 6–8.

3. *Marchantia breviloba* Evans, Trans. Conn.
Acad. 21: 265. 1917.

Thallus pale-green, more or less glaucous, sometimes purplish beneath and along the margin, mostly 2–5 cm. long and 0.5–0.8 cm. wide, firm but not leathery; epidermis composed of cells with somewhat thickened walls, locally in 2 layers, averaging about $65 \times 28 \mu$; surface-papillae lacking; pores usually bounded by 6 circles of cells with 4 (or more) cells in each circle, those of the innermost circle mostly 4, enclosing a broad opening with concave sides; ventral tissue with sclerotic cells and usually with slime-cells; ventral scales in 4 rows; appendages of median scales ovate to orbicular, mostly 0.5–0.65 mm. long and 0.45–0.55 mm. wide, rounded to apiculate at the apex, sparingly and minutely toothed on the margin. Male receptacle borne on a stalk 1.5–2 cm. high, with 2–4 rhizoid-furrows and a single narrow band of green tissue, mostly 1–1.5 cm. broad, deeply lobed, the lobes mostly 6 or 7, palmately spreading; female receptacle borne on a stalk 6–8 cm. long, with 4 rhizoid-furrows and a single broad band of green tissue, mostly 6–8 mm. broad, usually 11-rayed, the rays short, 1 mm. long or less, with one sinus broader than the others, scarcely or not at all dilated at the apex, flat, without surface-papillae; involucre not lobed, ciliate; spores yellowish-brown, about 34μ in diameter, tetrahedral, with narrow wings and low surface-lamellae; elaters about 8 μ wide. Cupules shortly and irregularly ciliate-dentate, destitute of papillae.

TYPE LOCALITY: Hardware Gap and vicinity, Jamaica.

DISTRIBUTION: Jamaica and Hispaniola; on banks.

ILLUSTRATION: Trans. Conn. Acad. 21: f. 9.

4. *Marchantia domingensis* Lehm. & Lindenb.;
Lehm. Stirp. Pug. 6: 22. 1834.

Marchantia inflexa Nees & Mont.; Mont. Ann. Sci. Nat. II. 9: 43. 1838.

? *Marchantia quinqueloba* Nees, Naturg. Eur. Leberm. 4: 98. 1838.

Marchantia disjuncta Sull. Am. Jour. Sci. II. 1: 74. 1846.

Marchantia linearis G. L. N. Syn. Hep. 529, in part. 1847. Not *Marchantia linearis* Lehm. & Lindenb. 1832.

Marchantia martinicensis Spreng.; G. L. N. Syn. Hep. 531, as synonym. 1847.

Marchantia Elliottii Stephani, Bull. Herb. Boiss. 7: 400. 1899.

Marchantia caracensis Stephani, Bull. Herb. Boiss. 7: 526. 1899.

Thallus pale-green to dark-green, not glaucous, slightly or not at all pigmented with purple, mostly 2–3 cm. long and 0.4–0.6 cm. wide, texture delicate; epidermis composed of cells with slightly thickened walls, sometimes in 2 layers locally, the cells averaging about 45–23 μ ; surface-papillae lacking; pores usually bounded by 6 circles of cells with 4 (or more) cells in each circle, those of the innermost circle mostly 4, enclosing a broad opening with the sides straight or nearly so; ventral tissue with numerous sclerotic cells but without slime-cells; ventral scales in 4 rows; appendages of median scales broadly lanceolate to ovate, mostly 0.35–0.6 mm. long and 0.25–0.45 mm. wide but sometimes much smaller, the apex apiculate, acute, or cuspidate, the margin closely denticulate or dentate, the teeth one or two cells long. Male receptacle borne on a stalk about 0.5 cm. long, with 2 or 4 rhizoid-furrows and a single broad band of green tissue, mostly 6–8 mm. broad, deeply lobed, the lobes mostly 4–6, palmately spreading; female receptacle borne on a stalk 1.5–2 cm. long with 2–4 rhizoid-furrows and a single broad band of green tissue, mostly 5–7 mm. broad, deeply rayed, the rays mostly 7, but sometimes as few as 5 or as many as 11, slightly or not at all dilated at the truncate, crenate, or slightly emarginate apex, without surface-papillae, one sinus broader than the others; involucre very delicate, crenulate to short-ciliate; spores brownish-yellow, about 28 μ in diameter, with a few surface-lamellae; elaters about 6 μ wide. Cupules closely short-ciliate, destitute of papillae.

TYPE LOCALITY: Santo Domingo.

DISTRIBUTION: Tennessee and Arkansas, southward to Florida, Alabama and Texas; Mexico and Central America; abundant in the West Indies; also in Venezuela; on banks.

ILLUSTRATIONS: Mem. Am. Acad. II. 3: pl. 3; Trans. Conn. Acad. 21: f. 10–12.

EXSICCATAE: Sull. Musci Allegh. 286; Aust. Hep. Bor.-Am. 128; Underw. & Cook, Hep. 182.

5. *Marchantia chenopoda* L. Sp. Pl. 1137. 1753.

Marchantia androgyna L. Sp. Pl. 1138, in part. 1753.

Chlamidium indicum Corda, in Opiz, Beitr. 647. 1829.

Marchantia Swartzii Lehm. & Lindenb.; Lehm. Stirp. Pug. 4: 9. 1832.

Marchantia cartilaginea Lehm. & Lindenb.; Lehm. Stirp. Pug. 4: 31. 1832.

Marchantia brasiliensis Lehm. & Lindenb.; Lehm. Stirp. Pug. 4: 32. 1832.

Grimaldia peruviana Nees & Mont.; Mont. Fl. Boliv. 53. 1839.

Marchantia peruviana Nees; G. L. N. Syn. Hep. 538. 1847.

? *Marchantia Notarisii* Lehm. Stirp. Pug. 10: 22. 1857.

Marchantia Dillenii Lindb. Krit. Gransk. Hist. Musc. 47. 1883.

Preissia mexicana Stephani, Hedwigia 22: 49. 1883.

Marchantia chenopoda cartilaginea Schiffn. Nova Acta Acad. Leop.-Carol. 60: 288. 1893.

Cyathophora mexicana Underw. Bot. Gaz. 20: 68. 1895.

Thallus pale-green or yellowish-green, sometimes more or less glaucous and usually purplish below, mostly 2–3 cm. long and 0.4–0.7 cm. wide, the texture varying from firm and leathery to delicate; epidermis composed of cells with slightly thickened walls, locally in two layers, sometimes containing slime-cells, averaging about 40 \times 22 μ ; surface-papillae lacking; pores usually bounded by 7 circles of cells with 4 (or often more) cells in each circle, those of the innermost circle 4–6, enclosing a broad opening with straight or somewhat concave sides; ventral tissue with sclerotic cells and usually with slime-cells; ventral scales in 4 rows; appendages of median scales very variable, lanceolate to broadly ovate, mostly 0.45–0.65 mm. and 0.3–0.4 mm. wide, acuminate, acute, or apiculate at the apex, entire or irregularly and sparingly toothed on the margin. Male receptacle borne on a stalk 1–2 cm. long, with 2 rhizoid-furrows, destitute of green tissue, mostly 0.8–1 cm. broad, deeply lobed, the lobes mostly 4, rarely 5 or 6, palmately spreading; female receptacle borne on a stalk 2–4 cm. high, with 2 rhizoid-furrows and 2 narrow bands of green tissue, mostly 6–8 mm. broad, shortly 5-rayed, the rays palmately disposed, convex, rounded, without papillae; involucre firm, sparingly dentate, to closely ciliate or laciniate, the teeth 1–5 cells long; spore brownish-yellow, about 26 μ in diameter, tetrahedral, with narrow wings and low surface-ridges; elaters about 6 μ wide. Cupules closely short-ciliate, destitute of papillae.

TYPE LOCALITY: Martinique.

DISTRIBUTION: Mexico to Panama; West Indies; also in South America.

ILLUSTRATIONS: Plum. Foug. Am. *pl.* 142; Dill. Hist. Musc. *pl.* 75, *f.* 5; Mem. Soc. Ital. Modena 30: *pl.* 6a, *f.* 1, 2; Trans. Linn. Soc. 17: *pl.* 12, *f.* 2; Trans. Conn. Acad. 21: *f.* 15-20.

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